

***United States Court of Appeals  
for the Second Circuit***



**APPENDIX**





75-7621  
75-7645

No. 75-7621

No. 75-7645

IN THE

United States Court of Appeals

FOR THE SECOND CIRCUIT

PLANTRONICS, INC.,

*Plaintiff-Appellant  
and Cross-Appellee.*

v.

ROANWELL CORPORATION,

*Defendant-Appellee  
and Cross-Appellant.*

APPEAL FROM THE UNITED STATES DISTRICT COURT  
FOR THE SOUTHERN DISTRICT OF NEW YORK

JOINT APPENDIX – EXHIBIT VOL. III  
(Exhibits K1 – DDD)  
(Pages 815 – 1253)

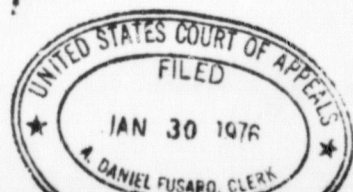
TOM ARNOLD  
PAUL M. JANICKE  
ARNOLD, WHITE AND DURKÉE

2100 Transco Tower  
Houston, Texas  
(713) 621-9100

*Attorneys for Plantronics*

*Of Counsel:*

ROBERT NEUNER  
BRUMBAUGH, GRAVES, DONOHUE AND RAYMOND  
30 Rockefeller Plaza  
New York, New York 10020  
(212) 489-3300



PAGINATION AS IN ORIGINAL COPY

# CONTENTS

<u>EXHIBIT NO.</u>	<u>TRIAL EXHIBITS</u>	<u>PAGE*</u>
	Numbered= Introduced by Plaintiff Lettered= Introduced by Defendant	
1.	Larkin patent (cert.) .....	1
2.	Hutchings patent (cert.) .....	6
3.	Hutchings Design patent (cert.) .....	12
4.	Roanwell R-70 headset .....	14
5.	Roanwell R-71 headset .....	15
6.	Mentzer Memo, June 30, 1960 .....	16
7.	WE 52 headset .....	22
8.	Hodgson memo, August 1960 .....	23
9.	Mentzer memo of 12/19/60 .....	24
10.	Airmed headset .....	25
11.	Amplivox Amplilite brochure .....	26
12.	Carter headset .....	30
13.	Twinset (Telex) .....	31
14.	ARINC spec. ....	32
15.	Mentzer Letter .....	44
16.	Plane-Aids Flyer .....	44A
17.	HS-33 Headset .....	45
18.	MS-50 Headset .....	46
19.	NASA photo of MS-50 in use .....	47
20.	Roanwell Report on MS-50 .....	48
21.	Powers "new generation" memo .....	52
22.	FAA Report (cert.) "Development of Lightweight Headset" .....	53
23.	NASA photo of MS-50 in use .....	106

\* Page numbers on exhibits are informal and are circled.



24.	NASA photo of MS-50 in use .....	107
25.	Roanwell DS book brochure .....	108
26.	Roanwell ad on Lightweight headsets .....	112
27.	Chart of Panel of Experts .....	113
28.	P. 1-12 from Western Report .....	115
29.	Beranek chart .....	119
30.	Olney patent .....	120
31.	Ohio State University Research Foundation Report #35 .....	134
32.	R-61 Sales figures .....	149
33.	Stip. on WECO production of Model 61 .....	152
34.	Martin patent .....	161
35.	Gilbert patent .....	166
36.	Telex boom mike ad .....	171
38.	Guttner patent .....	172
39.	Erickson patent .....	175
41.	Beranek text - pp. title, copyright, 731-735, 187-189, 900, 911 .....	182
42.	Pritchett patent .....	194
44.	Henderson patent .....	203
45.	Kelly patent .....	206
46.	Spencer and Robertson article, A Lightweight Headset for Telephone Operators .....	210
47.	Robertson Brit. patent 776,896 .....	215
48.	Amplivox Minilite headset .....	221
49.	Electro-Voice Headset - EP 6084 .....	222
63.	Larkin file history (cert.) .....	223
66.	MS-43 description .....	272
67.	Flygstad patent 3,280,273 .....	277
68.	Peterson article on 61 program .....	281
69.	Sketches of Models A, B, C, D .....	285
70.	Bryant patent 3,440,365 .....	286

71.	AT&T Annual Report - 1967 - cover photo of model 61 .....	292
72.	Unex report .....	293
73.	Fotter memo of 7/24/69 .....	301
74.	Unex/Roanwell contract .....	303
75.	Roanwell Layout #2 .....	306
76.	Roanwell Layout #3 .....	307
77.	Unex report after USITA .....	308
79.	German Auslegeschrift 1,132,973 .....	322
81.	German Auslegeschrift 1,078,175 .....	329
82.	German Auslegeschrift 1,139,549 .....	336
83.	Auriculina ad (Siemens) .....	347
90.	Strzalkowski patent .....	348
95.	Huth Patent 3,098,127 .....	357
97.	Dreher patent .....	361
99.	Hutchings diary re. events 23 Dec. 68 to 2 Feb. 69 .....	365
103.	First working StarSet model .....	370
104.	StarSet .....	371
105.	Ennis memo .....	372
106.	Whitney memo .....	373
107.	AT&T 1973 Annual Report showing StarSet on cover .....	375
108.	Stip. re. sales figures .....	376
110.	Whitney memo re. FAA eval. ....	382
111.	Audiotone memo rejecting over-the-ear approach .....	384
112.	Oticon hearing aid (EP 2413) .....	387
113.	Weiss patent .....	388
120.	Unex memo re. "similar to PPI design" .....	394
121.	WESCON Industrial Design Award .....	395
122.	File history of Hutchings 3,548,118 .....	400

123.	Otarion components; stipulation on Otarion components .....	455
124.	Chart of Larkin claim 1 and drawing of R-71 .....	456
125.	Olney article .....	457
126.	Chart: Hutchings cl. 1 vs. R-70 .....	463
127.	Lucite post-auricle hook photo .....	464
128.	Vanco hearing aid ad .....	465
129.	Qualitone hearing aid ad .....	472
130.	Maico Selectronic hearing aid ad .....	475
131.	Beranek Fig. 16-14 .....	477
132.	File History of Hutchings des. pat. ....	478
133.	Chart - StarSet vs. Model 61 Sales 1970-1974 .....	507
134.	RHM-1 Roanwell Lightweight Headset .....	509
135.	Chart - Hutchings Figs. 1, 2 vs. Roanwell R-70 .....	510
136.	Chart - Larkin claim 1 vs. Plantronics MS-50 .....	511
137.	Chart: Roanwell Acoustics Laboratory Report of November 8, 1962. "Analysis of Plantronics Headset" .....	512
139.	Clark Letter of 8/16/69 .....	519
140.	Collection of Roanwell Deposition exhibits ..	520
141.	Venture I headset .....	623
143.	Photograph of Unex Prototype of R-71 .....	624
143A.	Physical exhibit of Unex Prototype of R-71 ..	625
144.	Photograph of Unex Prototype of R-70. ....	626
144A.	Physical exhibit of Unex Prototype of R-70 ...	627
146..	Prototype model of Dreher headset .....	628
151.	Sketch by Kenneth Hutchings .....	629
152.	Sketch by Kenneth Hutchings .....	630
153.	Sketch by Kenneth Hutchings .....	631
154.	Sketch by Kenneth Hutchings .....	632



# DEFENDANT'S EXHIBITS

DX-C	Prior art book re. Larkin patent 3,184,556 .....	633
DX-D	Book of PPI ads and sales flyers .....	754
DX-E	USA Standard Acoustical Terminology, Approved May 25, 1960, front cover, 5 pages of credits and pp. 9 & 28 .....	769
DX-F	A book of sample sales literature concerning the Robertson (STC) headset .....	777
DX-H	Western Electro-Acoustic Laboratory (WEAL) Final Report dated February 1959, entitled "Study and Investigation Of Specialized Electro-Acoustic Transducers For Voice Communication In Aircraft", front cover, first five pages and section 2.0 .....	797
DX-K-1	Prior art book re. Hutchings patent 3,548,118 .....	815
DX-K-2	Physical exhibit: Audiotone Model 77 hearing aid case .....	872
DX-L-1	Photo of model wearing a Roanwell R-70 headset .....	873
DX-L-2	Photo of a Roanwell R-70 headset .....	874
DX-L-3	Physical exhibit: Roanwell R-70 headset .....	875
DX-M-1	Photo of a model wearing a Roanwell R71 headset .....	877
DX-M-2	Photo of a Roanwell R71 headset .....	878
DX-M-3	Physical exhibit: Roanwell R71 headset .....	879
DX-N-1	Roanwell's first R70 sales flyer .....	881
DX-N-2	Photo of the Roanwell booth at the USITA show on October 19-22, 1969 .....	882
DX-O-1	Unex sketch #19 (2483) .....	883
DX-O-2	Unex sketch #20 (2482) .....	884
DX-R-1	Prior art book re. Hutchings design patent Des. 218,173 .....	885
DX-R-2	Physical exhibit: Vance hearing aid case ...	909
DX-S	Hutchings patent 3,610,841 .....	911
DX-T	File history of Hutchings patent 3,610,841 ..	915
DX-U	Physical exhibit: PPI StarSet headset .....	948
DX-W-1	Letter dated March 27, 1962 from Graham to Barney Langford of Audiotone ....	950



DX-W-2	Memo dated March 15, 1962 from J.R. Johnson to Joseph Lagman .....	951
DX-W-3	Single page of sketches, undated, designated EP 7099 .....	954
DX-X-1	Letter dated March 2, 1967 from Graham to Schiavoni of AT&T (EP 0860-58) .....	955
DX-X-2	Attachment I entitled "Headset Description MS-50 Type Second Generation (Designated MS-50-45)" .....	958
DX-X-3	Attachment II PPI paper entitled "Patent Position on Miniature Microphone-Receiver Headsets" .....	963
DX-X-4	Attachment III entitled "Headset Description MS 51 - Earmold Mounted Type" .....	965
DX-X-5	Attachment IV entitled "The Evolution of The KS 19796 Headset" .....	972
DX-Y-1	Letter dated September 8, 1964 from Byron G. Langford -f Audiotone to Larkin .....	979
DX-Y-2	Audiotone Drawing P1033-3, dated February 1, 1962 .....	980
DX-Z	Larkin-Dennis paper entitled "The Use of Acoustical Tubes To Improve Microphone Performance" .....	981
DX-CC	Book I of Hutchings drawings .....	988
DX-DD	Book II of Hutchings drawings .....	994
DX-EE	Hutchings notebook pages 71 to 74 dated January 13 to February 4, 1969 .....	1003
DX-FF	Minutes of Engineering Meeting at Plantronics on December 21, 1968 .....	1007
DX-II-1	Larkin British patent 1,009,818 .....	1010
DX-II-2	Larkin British Patents Form No. 1 .....	1015
DX-II-3	S.G. Brown Ltd. license dated February 5, 1965 .....	1017
DX-II-4	S.G. Brown Ltd. license dated July 1, 1968 with Appendices A to D .....	1020
DX-II-5	Letter dated August 12, 1964 to Keith Larkin .....	1041

DX-II-6	Letter dated August 12, 1964 from Stevens, Langner to C.P. Graham .....	1042
DX-II-7	Letter dated August 13, 1964 from V.H.A. Diederichs to Keith Larkin .....	1044
DX-II-8	Letter dated August 18, 1964 from Keith Larkin to Stevens, Langer .....	1046
DX-II-9	Letter dated September 9, 1964 from V.H.A. Diederichs to Keith Larkin .....	1047
DX-II-10	Letter dated February 19, 1966 from A.H.S. Pickburn to Keith Larkin .....	1049
DX-II-11	Letter dated March 25, 1966 from S.G. Spragens to Maurice Benavitch .....	1050
DX-II-12	Letter dated March 25, 1966 from S.G. Spragens to Dr. M. Went .....	1051
DX-II-13	Letter dated March 25, 1966 to S.G. Spragens .....	1053
DX-II-14	Letter dated April 1, 1966 from S.G. Spragens to A.H.S. Pickburn .....	1054
DX-II-15	Letter dated October 6, 1967 from C.P. Graham to S.G. Brown Ltd. ....	1056
DX-II-16	Letter dated February 14, 1968 from William B. Christy IV to Paul E. Homrighausen .....	1058
DX-II-17	Letter dated September 25, 1970 from Victor H.A. Diederichs to S.G. Spragens .....	1059
DX-II-18	Letter dated October 16, 1970 from S.G. Spragens to V.H.A. Diederichs .....	1061
DX-II-19	Letter dated August 30, 1972 from S.G. Spragens to V.H.A. Diederichs .....	1063
DX-KK	Letter dated August 19, 1965, from Lester W. Clark to John P. Austin .....	1064
DX-LL	Book of documents from <u>Telex v. PPI</u> .....	1066
DX-MM(D)	Defendant's Summary of MM .....	1091
DX-NN	Trumbull Transcript of February 1, 1973 (pages 1-4 and 9 to the end), plus attached deposition exhibits 1 to 23 [cover; pp. 1-4, 22, 48] .....	1097
DX-OO	Chognard Transcript of November 8, 1973, plus attached deposition exhibits 1 to 9, and Chognard Responses to Written Questions 1 to 7 and Further Response To Question 6 .....	1104
DX-OO(D)	Defendant's Summary of OO .....	1184
DX-SS(D)	Defendant's Summary of SS .....	1188

DX-TT	PPI Interrogatory Answers .....	1190
DX-UU	PPI Admissions .....	1194
DX-VV	British Ministry Report .....	1205
DX-WW	Outline Drawing of PPI StarSet and Roanwell R-70 .....	1222
DX-XX-1	Roanwell R-70 response curves for changes in voice tube length .....	1223
DX-XX-2	Roanwell R-71 response curves for changes in voice tube length .....	1224
DX-YY-1	"Acoustic Measurements" by Beranek, title page, 2nd page and p. 198 .....	1225
DX-YY-2	"Speech and Hearing in Communication" by Fletcher, title page, 2nd page and pp. 106-7 .....	1228
DX-YY-3	"Design Principles of Electroacoustic Devices" by Romanow, title page, 2nd page, preface, pp. 25-30 .....	1232
DX-ZZ-1	Roanwell Brochure entitled "Dynamic Noise-Cancelling Microphone Model RM-33" .....	1241
DX-ZZ-2	Physical exhibit: Roanwell M-33 A/AIC Microphone .....	1243
DX-AAA	Physical exhibit: Roanwell R-61 headset ....	1246
DX-BBB	Chart entitled "Acoustical Voice Tube Comparison" .....	1248
DX-CCC	Portion of the M-33 microphone .....	1251
DX-DDD	Knowles sales flyer entitled "Subminiature Transducers, B-1502" .....	1253



PRIOR ART BOOK

RE

HUTCHINGS PATENT NO. 3,548,118\*

1. Flygstad et al patent 3,280,273, granted October 18, 1966
2. Photographs of Plantronics MS-43 headset  
(with PPI's answers to Interrogatories 14 (in part), 26  
and 28 through 30 from Telex v. PPI civil action  
C 70-1340; and an Audiotone sales flyer on its "Model  
77" hearing aid)
3. Erickson patent 2,882,348, granted April 14, 1959  
(with PPI's answer to Interrogatory 13 from Telex v. PPI  
civil action C 70-1340)
4. Guttner et al U.S. patent 3,209,080, granted September  
28, 1965 (with ads showing the Siemens Auriculina hearing  
aid in The Hearing Dealer, April 1963, page 25, and in  
The [British] Journal Of The Society Of Hearing Aid  
Audiologists, 1962, page 32)
5. German DAS 1,139,549, published November 15, 1962  
(with English translation)
6. Oticon hearing aid photograph and full-page ad from The  
Hearing Dealer, September 1968, page 4
7. German DAS 1,132,973, published July 12, 1962  
(with English translation)
8. Bryant et al patent 3,440,365, granted April 22, 1969

---

\* See also the British Ministry of Aviation report entitled  
"User Trials of the Plantronics Model MS-50 Lightweight  
Headset", ATCEU Note No. 154, by F.J.L. de Frias, October  
1962, paragraphs 4.6 and 5.7.

Ex. K-1

815

Oct. 18, 1966

D. W. FLYGSTAD ETAL

3,280,273

SELF-SUPPORTING OPERATOR'S HEADSET

Filed Sept. 11, 1963

2 Sheets-Sheet 1

FIG. 1



FIG. 2

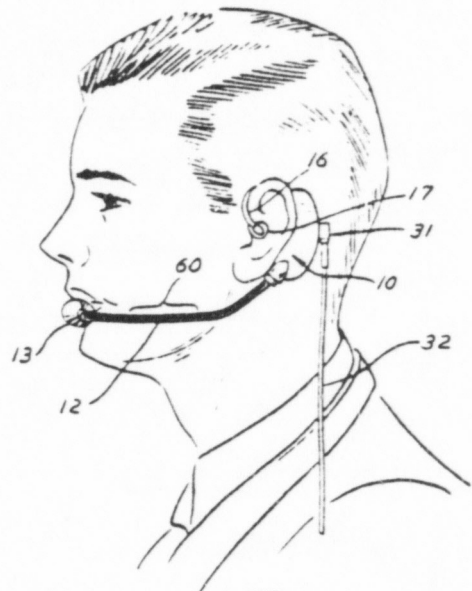


FIG. 3

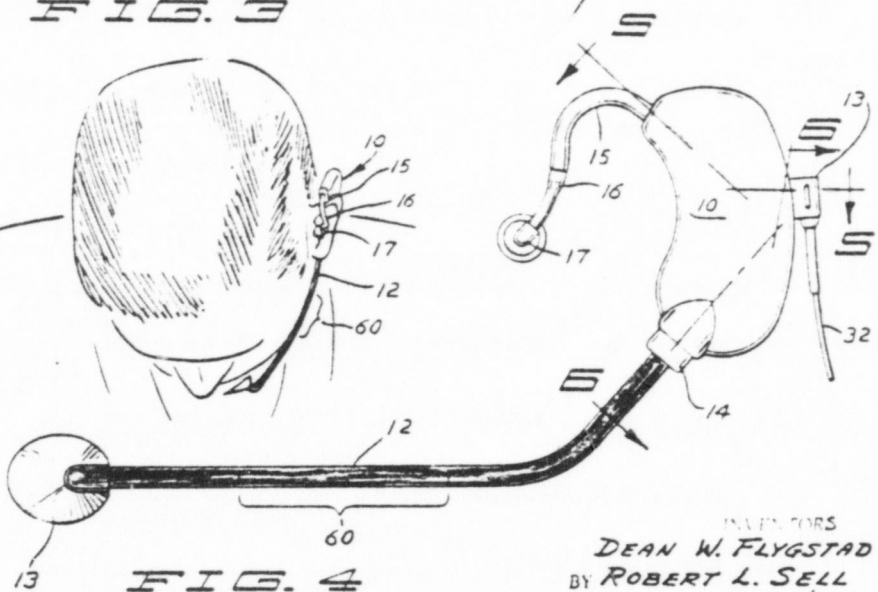
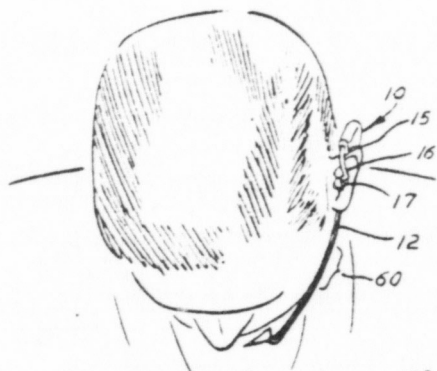


FIG. 4

INVENTORS  
DEAN W. FLYGSTAD  
BY ROBERT L. SELL  
Carlson, Carlson & Stuenkel  
ATTORNEYS

816

Oct. 18, 1966

D. W. FLYGSTAD ET AL  
SELF-SUPPORTING OPERATOR'S HEADSET

3,280,273

Filed Sept. 11, 1963

2 Sheets-Sheet 1

FIG. 7

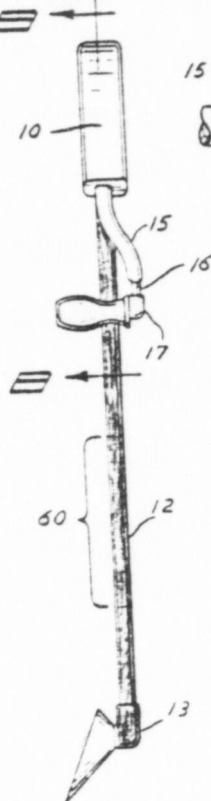


FIG. 5

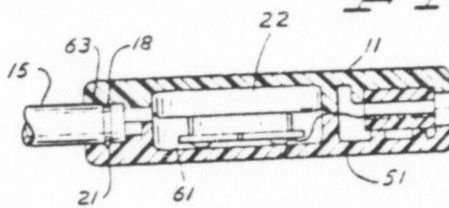


FIG. 6

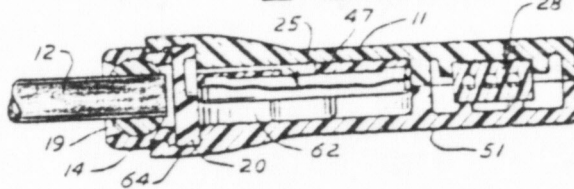


FIG. 8

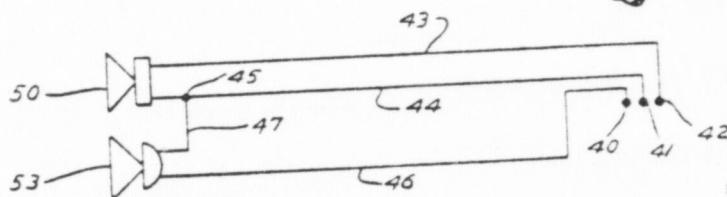
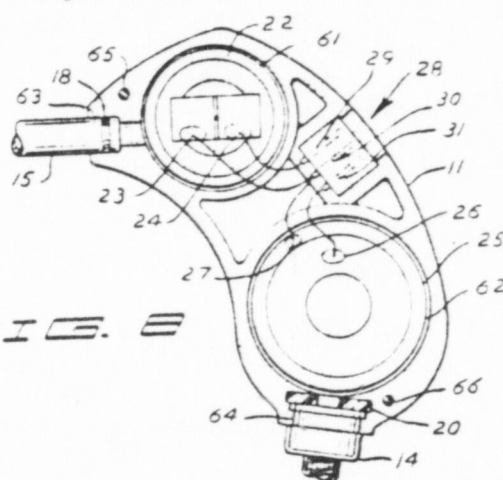


FIG. 9

INVENTORS  
DEAN W. FLYGSTAD  
BY ROBERT L. SELL  
CARSON, CARLSON & ALLEN  
ATTORNEYS

817



1

3,280,273

## SELF-SUPPORTING OPERATOR'S HEADSET

Denn W. Flygstad, Roseville, and Robert L. Sell, Minneapolis, Minn., assignors to The Telex Corporation, Tulsa, Okla., a corporation of Delaware  
Filed Sept. 11, 1963, Ser. No. 308,240  
8 Claims. (Cl. 179—156)

This invention relates generally to two-way communication apparatus and is more particularly related to apparatus containing a receiver and a microphone that is intended to be worn by an operator.

In the prior art with which this invention is concerned, much effort has been directed to provide lightweight, comfortable and efficient headsets to be used, for example, by telephone operators. One common feature found in the prior art is an intermediate supporting structure to hold a receiver in sound transmitting relationship with an operator's ear and a microphone in sound receiving relationship with an operator's mouth. One recent example of such supporting structure is a headband which extends up and across a substantial portion of the top of an operator's head. Another example supports the necessary apparatus on the bow, or temple member, of a pair of eyeglasses. In still another example, a receiver may be supported on a headband and a microphone may be supported in structure adapted to be suspended around the operator's neck. These and other examples of the prior art may be found lacking in one or more of the desirable features noted above.

In our invention, we have provided a novel and useful improvement in providing a self-supporting headset. Briefly, our apparatus includes a housing that has depending sound conducting members, for supporting and stabilizing the headset on the head of an operator, and a suitably mounted receiver and microphone, all of which coact to provide a combination of elements that is lightweight, comfortable and efficient.

It is therefore an object of our invention to provide a novel operator's headset.

It is a further object of our invention to provide a self-supporting operator's headset.

These and other more detailed and specific objects will be disclosed in the course of the following specification, reference being had to the accompanying drawings, in which—

FIGS. 1-3 illustrate a preferred embodiment in position on an operator's head.

FIG. 4 is a side elevational view of the preferred embodiment of our invention.

FIG. 5 is a sectional view taken along section lines 5-5 in FIG. 4.

FIG. 6 is a sectional view taken along section lines 6-6 in FIG. 4.

FIG. 7 is a plan view of the preferred embodiment of our invention.

FIG. 8 is a sectional view taken along section lines 8-8 in FIG. 7.

FIG. 9 is an illustrative electrical schematic drawing of the electrical portion of our invention.

Referring now to the drawings in which like reference numerals have been applied to like elements of our invention, there is shown a self-supporting operator's headset comprised of a housing 10 which may contain a receiver 22 and a microphone 25 that are appropriately positioned to coact with a forwardly extending tube member 15 and a second forwardly extending tube member 12. Tube member 15 is in turn connected to a further tube member 16 that is adapted to carry an ear insert 17. Tube member 12 is mounted in a ball 19 and socket 14 and extends forwardly from the lower end of housing

2

10 and carries at its forward end a megaphone 13. Tube 12 is adapted to engage the cheek of an operator at a point or points along its length as indicated by bracket 60.

As will be apparent from the drawings, housing 10 is comprised of a pair of substantially identical members 11 and 51 which, when suitably disposed, combine and coact to define a pair of acoustically independent transducer mounting chambers 61 and 62 at opposite ends of the assembled housing 10. A further chamber is provided intermediate the acoustically independent chambers for mounting a three-terminal jack, indicated generally by the reference character 28.

Chamber 61 is adapted to receive and hold a receiver 22 having a pair of input terminals 23 and 24 that are connected through suitable conducting means to a further pair of terminals 29 and 30 on jack member 28. Chamber 61 also includes a forwardly extending aperture 63 which is adapted to receive the end of tube member 15.

Chamber 62 is adapted to receive and mount a microphone 25 which is provided with a pair of output terminals 26 and 27 that are connected through suitable conductors to terminals 30 and 31 on jack member 28. Chamber 62 also includes a generally forwardly extending aperture 64 for receiving socket 14 and sound baffling member 20. A further sound baffling member 47 is shown positioned at the bottom of chamber 62 on member 11. Sound baffling member 20 includes a first slot extending completely through and a second groove extending partly through member 20 to define an opening which is adapted to coact with a radially extending channel on the lower surface of baffling and gasket member 47, which in turn is in communication with a centrally located aperture for transmission of sound to microphone 25.

Member 11 also includes upwardly extending locating pin members 65 and 66 which are adapted to coact with similarly positioned apertures in member 51 to provide suitable registration of members 11 and 51 for assembling the apparatus. Members 11 and 51 may be assembled to form housing 10 after receiver 22, microphone 25, baffles 47 and 20 and jack 28 are positioned and suitably interconnected and may be cemented together through the use of any suitable adhesive which will provide the desirable acoustical insulating properties to ensure acoustical isolation between chambers 61 and 62.

Tube 15, which may be comprised of any suitable semi-rigid plastic material, is provided with a groove 18 which may coact with a pin member 21 mounted in member 51 so as to allow rotation of tube member 15 in aperture 63. Tube member 15 is, in turn, connected to a further tube member 16, which may be of a pliable material. An earplug 17 is shown mounted on the end of tube 16 and may be of suitable shape and compliance to be comfortably inserted in the auditory canal of an operator.

Tube member 12 is held in ball 19 through the use of a suitable adhesive. Ball member 19 is in turn rotatably journaled in a socket 14 which is in turn positioned and held in aperture 64 at the lower end of housing 10. Tube member 12 may also be comprised of a semi-rigid plastic material and has mounted at its forward end a megaphone 13 that is adapted to receive sound from the mouth of an operator and may be of any suitable size and shape.

In FIG. 4 of the drawing a suitable three-conductor plug member 31 is shown in position on jack 28 and is in turn connected to a suitable cable 32 that may be connected to suitable communication equipment which includes a source of signal and signal utilization means.

In FIG. 9 an electrical schematic representative of circuitry that may be employed with our invention is shown. A three-terminal plug represented generally by

(818)

reference characters 40, 41 and 42 is shown connected in circuit with a microphone 53 and a receiver 50, each of which has a pair of terminals. One of the terminals on receiver 50 is connected to terminal 41 through conductor 44 and is also connected to one of the terminals on microphone 53 through terminal 45 on conductor 44 and conductor 47. The other terminal on receiver 50 is connected to terminal 42 through conductor 43. The second terminal on microphone 53 is connected to terminal 40 through conductor 46.

It may thus be seen that our invention broadly includes a housing 10 which may have a first forwardly extending tube member 15 and a second forwardly extending tube member 12 and a jack 28 for connection to suitable communications equipment through cable 32.

Referring now to FIGS. 1, 2 and 3, our invention is shown in position on the head of an operator. Housing 10 is positioned directly behind the ear of the operator and tube member 15 extends forwardly to lie on the top of the ear and thence downwardly to provide a coupling to the auditory canal of the operator. Tube member 12 extends forwardly into engagement with the cheek of the operator along the area indicated by reference numeral 60 and the megaphone 13 is positioned in proximity to the mouth of the operator in a position which will provide for the most efficient transfer of intelligible sound energy from the particular operator using our apparatus.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described our invention, what we claim to be new and desire to protect by Letters Patent is:

1. An operator's headset comprised of an elongated hollow housing containing a receiver and a microphone, said housing being shaped to lie behind the ear of an operator, said housing also having a tubular portion extending forwardly from its top over the ear of an operator and into proximity of the auditory canal, said housing also having a tubular portion extending forwardly from its lower end into contact with the face of the operator and into proximity of the mouth of the operator whereby the housing is supported solely by the ear and face of the operator.

2. An operator's headset comprising: a housing having a portion adapted to engage the back of the ear of an operator, said housing being vertically elongated and having separate chambers in proximity to the top and bottom ends thereof, each of said chambers having an aperture extending generally forwardly thereof; a microphone in the bottom chamber; a receiver in the top chamber; a tube extending forwardly of the aperture in said top chamber to lie on top of the ear and downwardly to extend into the auditory canal of an operator; a further tube extending generally forwardly of the aperture in said bottom chamber, said tube being adapted to lie on the cheek and extend into proximity of the mouth of an operator.

3. The apparatus of claim 2 in which the further tube is pivotally mounted in the aperture in said bottom chamber.

4. The apparatus of claim 3 in which the tube extend-

ing from the top chamber is rotatably journaled in the aperture.

5. The apparatus of claim 2 in which first and second resilient gaskets, each having sound energy transmitting channels and apertures, coact to provide a conduit for the transmission of sound from the aperture on the bottom end of the housing to the diaphragm of the microphone mounted therein.

6. An operator's headset comprising in combination: a hollow housing including terminal means for connection to a source of signal and a signal utilization means, said housing being of generally arcuate shape to lie behind and engage the ear of an operator; a first forwardly and downwardly extending tube member at the top of said housing, said tube member being adapted to engage the ear of an operator along a portion of its length and cooperating therewith to support the housing on said ear; sound receiving means electrically associated with said terminal means, and associated with said tube member to supply sound energy to the auditory canal of an operator; a second forwardly extending tube member at the bottom of said housing, said tube member being adapted to engage the side of the face of an operator and having an opening adapted to be positioned in sound receiving relationship to the mouth of an operator; and microphone means electrically associated with said terminal means and associated with said second tube member to receive sound energy from the mouth of an operator.

7. An operator's headset comprised of a housing member adapted to abut the rear portion of an operator's ear; a forwardly extending tube member adapted to extend over the top of an operator's ear; a further tube member extending forwardly into proximity with the mouth of an operator and adapted to lie in engagement with the cheek of an operator, said housing and tube members cooperating to support and stabilize the headset on the ear of an operator.

8. Improved self-supporting communication apparatus comprising in combination: a microphone and receiver; a hollow housing including forwardly extending sound conducting members, one of said members being adapted to engage the top of the ear of an operator and to apply sound energy to said ear, and the other of said members extending into proximity of the mouth of an operator and being adapted to engage the cheek of an operator whereby said hollow housing is supported only by said sound conducting members; and means mounting said microphone and said receiver in said housing in acoustically independent relationship so that said one member provides sound energy to the ear of an operator and said further member receives sound energy from the mouth of the operator.

#### References Cited by the Examiner

##### UNITED STATES PATENTS

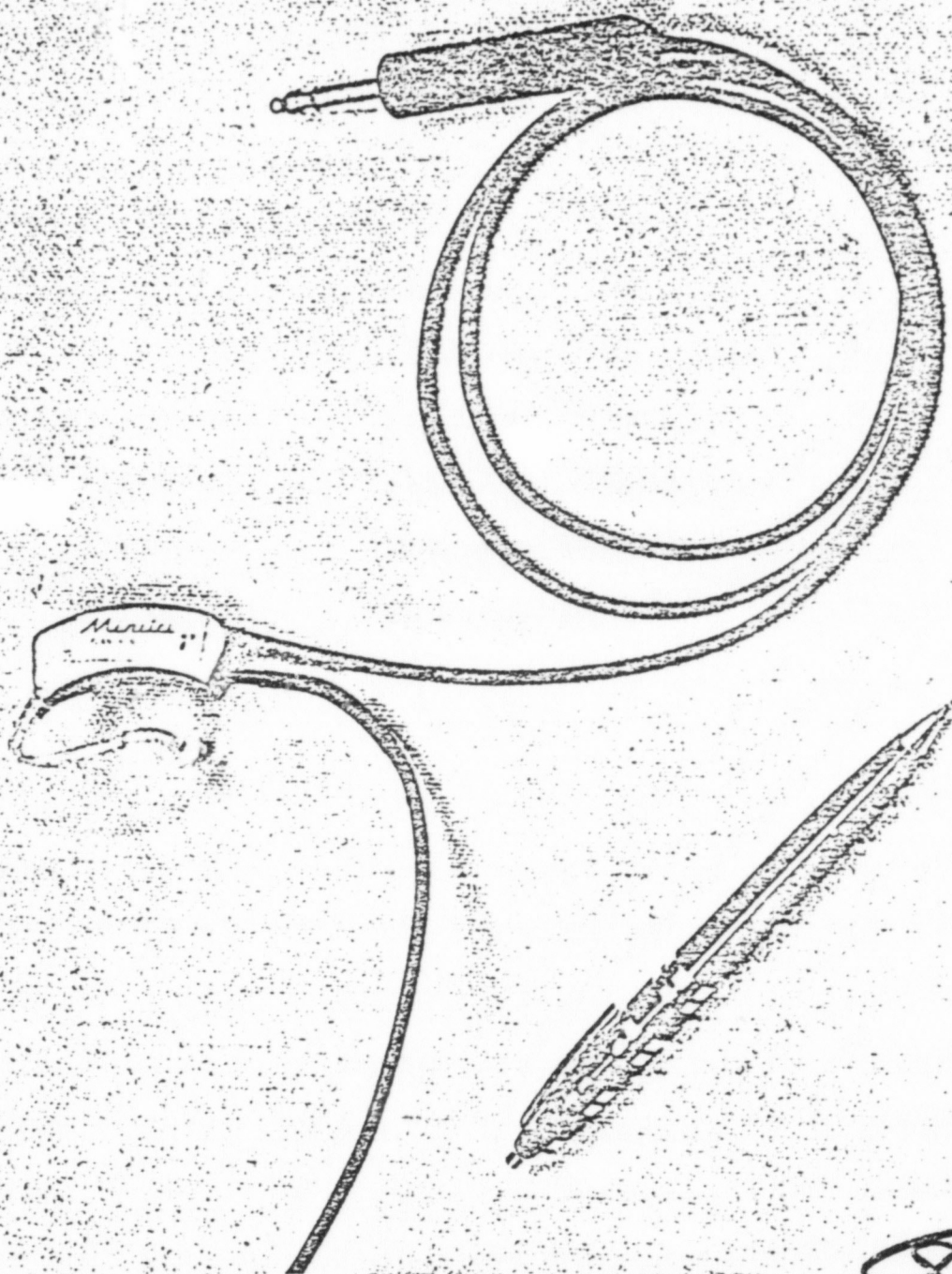
2,904,640 9/1959 Dreher et al. 179-156  
3,184,556 5/1965 Larkin 179-156

KATHLEEN H. CLAFFY, Primary Examiner.

WILLIAM C. COOPER, Examiner.

819





POST AURICLE MOUNTED HEADSET  
DEVELOPED MARCH 1962. REFERRED  
TO AS MS43 MODEL

820

EP 4805



MS43 POST AURICLE TYPE HEADSET  
USED IN SWITCHBOARD SERVICE  
EVALUATION

821

a. 801.



1 FLEHR, MOHBACH, TEST,  
2 ALBRITTON & HERBERT  
3 ALDO J. TEST  
4 THOMAS O. HERBERT  
5 160 Sansome Street - 15th Floor  
6 San Francisco, California 94104  
7 Telephone: 731-1939

8 Attorneys for defendant

9 IN THE UNITED STATES DISTRICT COURT  
10 FOR THE NORTHERN DISTRICT OF CALIFORNIA

11 THE TELEX CORPORATION, )  
12 )  
13 Plaintiff, ) Civil Action No. C79 1340 LMB  
14 v. )  
15 ) DEFENDANT'S ANSWERS TO  
16 ) INTERROGATORIES  
17 PACIFIC PLANTRONICS, INC., )  
18 )  
19 Defendant. )

20 COMES NOW defendant, Pacific Plantronics, Inc., and  
21 in response to Plaintiff's Interrogatories to Defendant submits  
22 the following:

23 — Interrogatory No. 14: Specify with particularity the  
24 factual basis for each requirement, clause or statutory basis  
25 set forth therein which Defendant, is, may, or intends to reply  
26 upon.

27 Answer: In addition to the matter set forth in  
28 answer to Interrogatory No. 13, the patent in suit is invalid for  
29 the following reasons as presently advised.

30 A. The patent in suit, particularly in the  
31 broad sense required to even assert infringement  
herein, was not invented by the alleged inventors

1 named therein, but was, in fact, derived from in-  
2 formation obtained from defendant itself by Robert  
3 Sell, one of the alleged inventors.

4 B. Defendant began work on a behind the ear  
5 headset in 1961 and during that year a mock-up  
6 headset was made as shown in Defendant's Exhibits  
7 23-29. In the winter of 1961-62 an operating  
8 prototype of this headset was fabricated at Audiotone  
9 in Phoenix, Arizona by Byron G. Langford. This  
10 operating headset was made from an Audiotone Model  
11 77 hearing aid with the microphone and receiver  
12 therein being re-wired to act as a pilot's headset.  
13 A piece of hearing aid pipe was used as the microphone  
14 tube. This unit was used during the winter of 1961-  
15 62 in an Aero-Commander airplane. Work continued on  
16 the behind-the-ear headset with emphasis on cost  
17 reduction. Such further work resulted in a unit  
18 having an external receiver rather than the more  
19 expensive internal receiver used in the Model 77  
20 hearing aid. This first external receiver unit was  
21 built and operated in the spring of 1962 and was  
22 similar to Defendant's Exhibit 33 but included no  
23 hinge. The hinge, as incorporated in Exhibit 33

24 was first used in May or June of 1962. The hinge  
25 units also included a snap-on tube extending from  
26 the external receiver to the auditory canal of the  
27 wearer (Defendant has located some of these tubes  
28 as well as additional parts for the models since the  
29 deposition of Mr. Sell. Such tubes and parts will  
30 be made available for inspection by plaintiff's

1 attorney). Several of these units were built and,  
2 although none were sold, they were given away and  
3 placed in public use in 1962. Among those who  
4 actually used the units are Mr. Gail Morris, formerly  
5 of Williams, Arizona, present address unknown; Mr.  
6 Jim Parker, formerly of Phoenix, Arizona, present  
7 address unknown; a Mr. Bohannon, formerly a pilot  
8 for Royal Industries in Pasadena, California; present  
9 address unknown; John R. Johnson, President of Royal  
10 Industries, Inc., Pasadena, California.

11 Consequently, defendant's own prior public use  
12 invalidates the patent.



15  
16  
17  
18  
19  
  
1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24

PACIFIC PLANTRONICS, INC.

By Courtney P. Graham  
Courtney P. Graham  
President

State of California )  
City & ) ss.  
County of San Francisco )

COURTNEY P. GRAHAM, being duly sworn, upon his oath  
deposes and says:

1. I am President of Pacific Plantronics, Inc., a  
corporation, and I am the agent of that corporation for the  
purpose of making the above answers to Plaintiff's Interrogatories  
to Defendant, served on the corporation on or about April 30,  
1971 and for making this verification.

2. The foregoing answers to Plaintiff's Interrogatories  
to Defendant are true according to the best of my knowledge,  
information and belief.

Courtney P. Graham  
Courtney P. Graham

Subscribed and sworn to before me  
this 7th day of May, 1971.

James A. Davidson  
Notary Public

JAMES A. DAVIDSON  
My Commission Expires Aug. 15th, 1971

825

GAIN ..... 47 db  $\pm$  3  
 SATURATION OUTPUT ..... 120 db  $\pm$  3  
 TYPE OF BATTERY ..... RM-675 or E675E  
 BATTERY DRAIN ..... 1.8 ma  
 EST. BATTERY SERVICE ..... 95 to 110 hours  
 COLORS ..... mink brown and flesh  
 WEIGHT .....  $\frac{1}{3}$  oz.  
 Data Expressed / HAIC Method



The above graph illustrates the acoustic frequency response versus sound pressure output with gain control in the maximum position.

#### HARMONIC DISTORTION

ACOUSTIC INPUT  
Level  
60 db

FREQUENCY  
500 1000  
1.4% 2.0%

Model 77 is best suited for persons requiring an Auricon sound pressure setting of 75-110 with Pitch 1 or 75-115 db with Pitches 2,3,4.

It is important when ordering this Audiotone Post-Auricle instrument to include all the following information:

1. Specify Model 77
2. Aurigram reading and customer name if instrument is to be "Custom Fitted".
3. Color (mink brown or flesh)
4. Specify if telephone pick up coil is desired (optional at no charge)

5. Specify adaptor



#1032-44 #101-6 #1032-40

This information will allow us to accurately and efficiently serve your requests.

## PERFORMANCE

## RESPONSE

## DESIGN & FITTING

## HOW TO

POST-AURICLE

826

1 FLEHR, HONBACH, TEST,  
2 ALBRITTON & HERBERT  
3 ALDO J. TEST  
4 THOMAS O. HERBERT  
5 160 Sansome Street - 15th Floor  
6 San Francisco, California 94104  
7 Telephone: 781-1989

8 Attorneys for Defendant

9 IN THE UNITED STATES DISTRICT COURT  
10 FOR THE NORTHERN DISTRICT OF CALIFORNIA

11 THE TELEX CORPORATION, )

12 Plaintiff, )

13 v. )

14 PACIFIC PLANTRONICS, INC., )

15 Defendant. )

Civil Action No. C70 1340 MIS

DEFENDANT'S ANSWERS TO  
PLAINTIFF'S SECOND  
INTERROGATORIES

16 COMES NOW defendant, Pacific Plantronics, Inc., and  
17 in response to Plaintiff's Interrogatories to Defendant (Second  
18 Set), served on the 21st day of March 1972, submits as follows:

17 Interrogatory No. 26: Specify the dates of any  
18 alleged public use of Defendant's Model MS-43 headset.

19 Answer: See Defendant's answer to plaintiff's  
20 Interrogatory No. 14. As presently advised defendant's public  
21 use of the MS-43 began in 1962 and continued for at least several  
22 years thereafter.

827



Interrogatory No. 28: State the dates, places, times, addresses and business positions of the individuals from whom Defendant contends the invention [inventors?] derived any information relating to the patent in suit.

Answer: As presently advised, Robert S. Sell derived information for the patent in suit from Keith Larkin and Courtney Graham in or about October of 1962 in Santa Cruz, California.

Interrogatory No. 29: For each act and person named above, specify the nature of such information.

Answer: As presently advised the nature of the information was either a model or a mock up of the MS-43 as shown in the photographs, Defendant's Exhibits D-23 and D-29.

Interrogatory No. 30: For each act and person named in the answer to Interrogatories 8 and 9 [28 and 29?] above, specify the alleged inventor of such information and the name of the person to whom it was disclosed.

Answer: It is deemed by defendant that there is no "inventor" of the information derived by Robert Sell since such information as well as the MS-43 specifically and the device shown in the patent in suit, was nothing more than the obvious combination of well known prior art devices. The MS-43 was designed, however, by one or more of the following: Keith Larkin Courtney Graham, Byron Langford, John R. Johnson.

PACIFIC PLANTRONICS, INC.

By

Courtney P. Graham  
Chief Executive Officer

828

STATE OF CALIFORNIA )  
City & ) ss.  
COUNTY OF San Francisco )

COURTNEY P. GRAHAM, being duly sworn, upon his  
oath deposes and says:

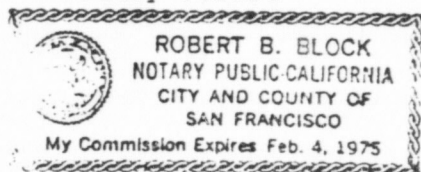
Chief  
1. I am Executive Officer of Pacific Plantronics,  
Inc., a corporation, and I am the agent of that corporation for  
the purpose of making the above answers to Plaintiff's  
Interrogatories to Defendant (Second Set), served on the  
corporation on or about March 21, 1972 and for making this  
verification.

2. The foregoing answers to Plaintiff's Interrogatories  
to Defendant (Second Set) are true according to the best of my  
knowledge, information and belief.

Courtney P. Graham

Subscribed and sworn to before me  
this 19<sup>th</sup> day of APRIL, 1972.

Robert B. Block  
Notary Public



829

Exclusively from SIEMENS..world's  
first and finest ear-level

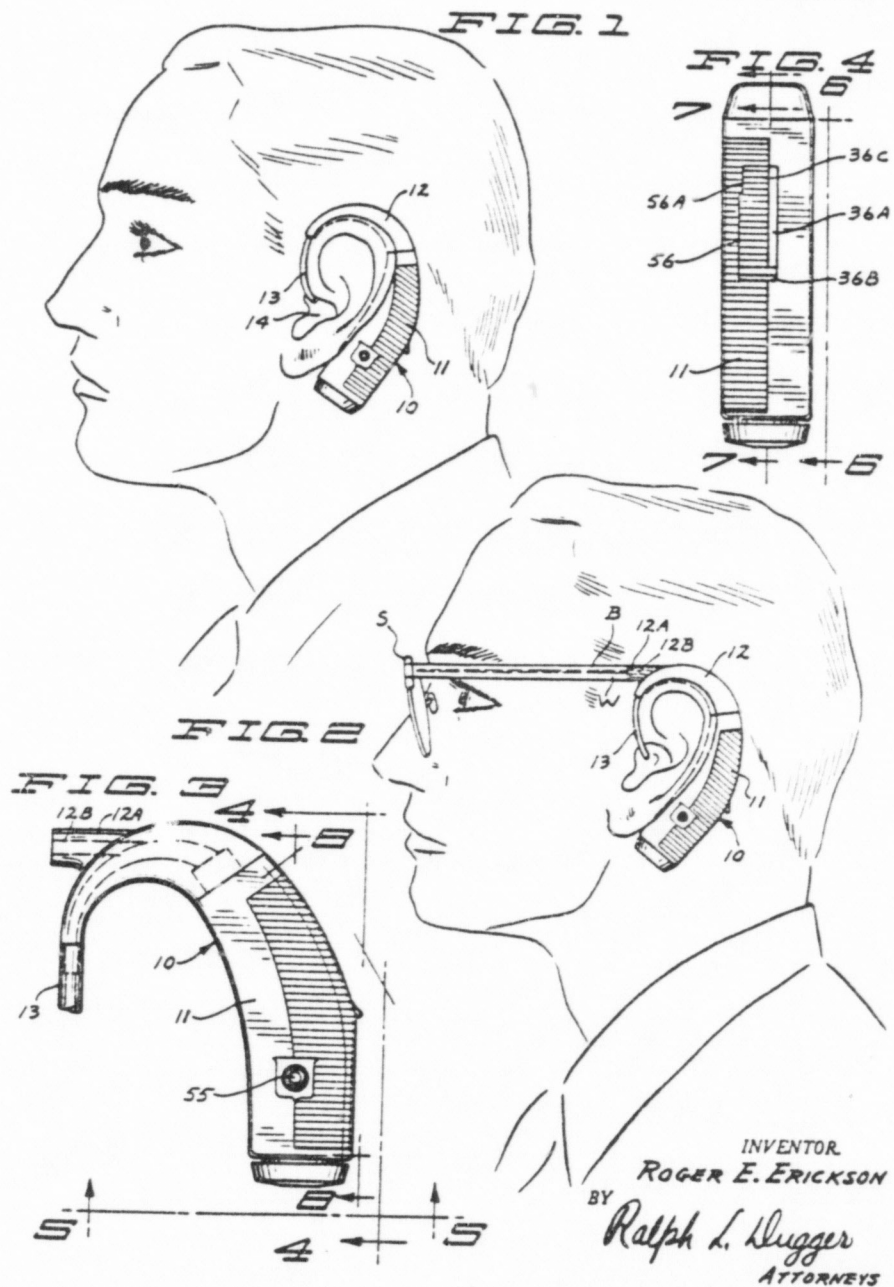
April 14, 1959

R. E. ERICKSON  
HEARING AID

2,882,348

Filed July 26, 1957

3 Sheets-Sheet 1



830



April 14, 1959

R. E. ERICKSON  
HEARING AID

2,882,348

Filed July 26, 1957

3 Sheets-Sheet 2

FIG. 6

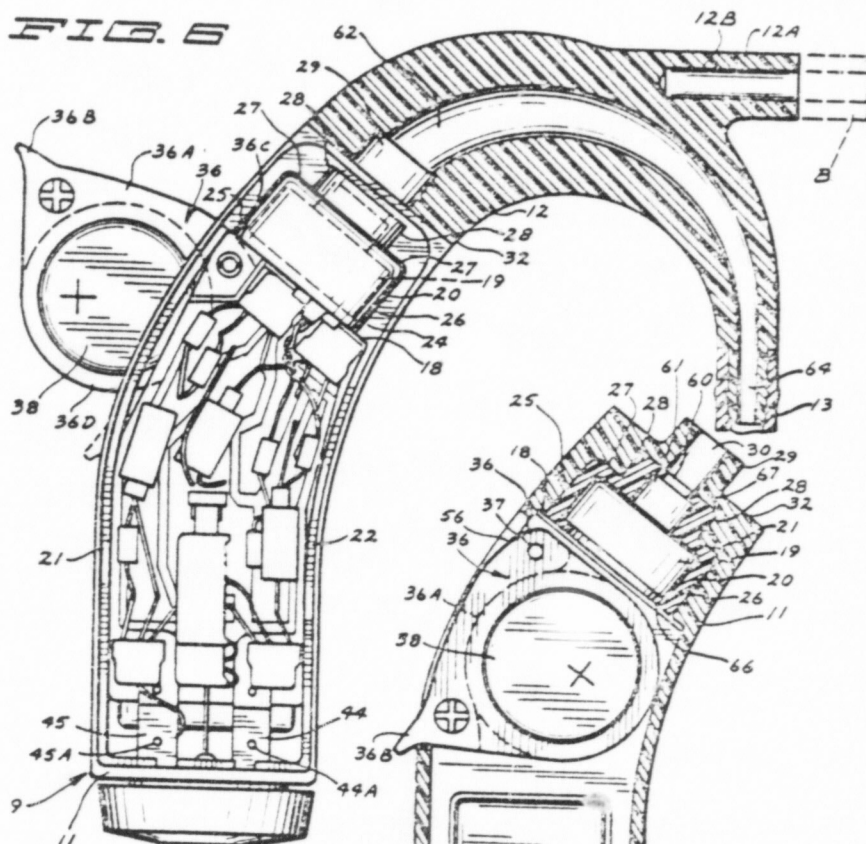
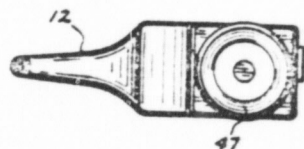


FIG. 7



FIG. 8



INVENTOR  
ROGER E. ERICKSON  
BY *Ralph L. Klugger*  
ATTORNEYS

831

April 14, 1959

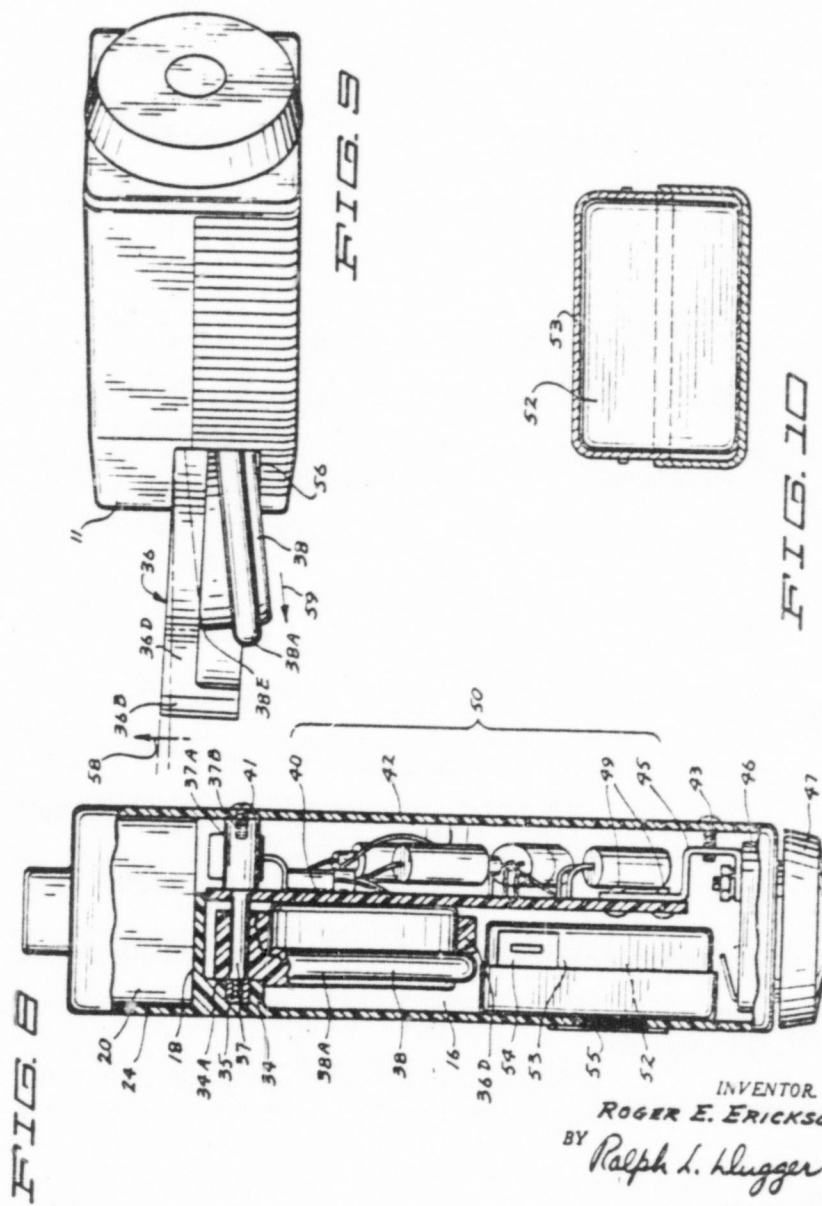
R. E. ERICKSON

2,882,348

HEARING AID

Filed July 26, 1957

3 Sheets-Sheet 3



INVENTOR  
ROGER E. ERICKSON  
BY *Ralph L. Hugger*  
ATTORNEYS

832

2,882,348

## HEARING AID

Roger E. Erickson, St. Paul, Minn., assignor to Telex, Inc., St. Paul, Minn., a corporation of Minnesota

Application July 26, 1957, Serial No. 674,343

4 Claims. (Cl. 179-107)

This invention relates to an improved self-contained battery powered hearing aid which may be worn directly adjacent and attached to the ear of the wearer, either with or without attachment to the bow of a standard spectacle. The invention relates particularly to a sub-miniature type of battery powered, transistor hearing aid, entirely self-contained, containing microphone and sound reproducer in mechanical arrangement so as to minimize microphonic feedback, and to provide adequate amplification of the sound frequencies normally heard by human individuals. It is an object of the present invention to provide a hearing aid of the aforesaid character and more particularly to provide a hearing aid capable of being fitted to the wearer without undue individual attention.

It is another object of the invention to provide an improved hearing aid of a shape, weight, and so constructed so that it can be worn comfortably by most individuals. It is another object of the invention to provide an improved hearing aid capable of being adapted readily for attachment to the earpiece bow of an ordinary spectacle, without any more adaptation than to snip off the spectacle bow at an appropriate length and attach it to the hearing aid component by adhesive or the like.

It is another object of the invention to provide an improved hearing aid wherein the battery is so contained as to be capable of being made available for easy access for replacement and yet so mounted that the battery cannot be readily dislodged and lost, thereby providing a structure which may be utilized easily by the elderly, and by those whose manual dexterity may be impaired. It is another object of the invention to provide an improved hearing aid which is free from interference due to fluorescent lights and the like electrical disturbances. It is a further object of the invention to provide an improved hearing aid of the design such that it can easily be made in either right or left so as to enable the hearer to mount the hearing aid adjacent either ear which may be impaired or to provide hearing aids for both ears, and thereby accomplish binaural sound reproduction for the wearer.

Other and further objects are those inherent in the invention herein illustrated, described and claimed and will be apparent as the description proceeds.

To the accomplishment of the foregoing and related ends, this invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principles of the invention may be employed.

The invention is illustrated with reference to the drawings wherein

Figure 1 is a side elevational view of a human individual's head showing one form of hearing aid apparatus

of the present invention mounted in position on the ear of the wearer.

Figure 2 is a side elevational view of the human head showing another form of hearing aid apparatus of the present invention in place on the ear of the wearer and attached to a spectacle bow.

Figure 3 is a side elevational view of the hearing aid apparatus shown in Figure 2 but removed from the ear of the wearer.

Figure 4 is a rear elevational view of the hearing aid apparatus shown in Figures 1 and 2 taken in the direction of arrows 4-4 of Figure 3.

Figure 5 is a bottom view of the hearing aid apparatus illustrated in Figure 3 taken in the direction of arrows 5-5 of Figure 3.

Figure 6 is a partial vertical sectional view taken along the lines and in the direction of arrows 6-6 of Figure 4. In this figure the hearing aid is viewed from that side which is normally adjacent the head of the wearer and the cover plate on this side, is removed in Figure 6. The sound tube horn, through which the sound is delivered to the ear of the wearer, is shown in section in Figure 6.

Figure 7 is a sectional view vertically (longitudinally) through the hearing aid apparatus, the sectioning being at a position and in the direction of arrows 7-7 of Figure 4. In this view the sound tube horn of the hearing aid apparatus, which delivers the sound to the wearer has been removed.

Figure 8 is a rear elevational view partly broken away taken just inside the rear wall along the line and in the direction of arrows 8-8 of Figure 3. Again, the sound tube horn which delivers sound to the ear of the wearer is removed from the hearing aid case in this view. The line of sectioning along which Figure 8 is taken is shown in Figure 3.

Figure 9 is a bottom view, looking directly upwardly, illustrating the hearing aid case when it is in normal wearing position as shown in Figures 1 and 2. For simplicity, the horn 12 is not shown in Figure 9. Also in this figure the battery frame is swung out and is slightly deflected in one direction and the battery is cocked in the other direction, preparatory to removal of the battery.

Figure 10 is a separated sectional view of the microphone metal sheath, with the microphone within it. The microphone is not shown in section. In this view these components are shown removed from the case of the hearing aid. This view is taken in the direction of arrows 10-10 and at the position of line 10-10 in Figure 7. The hearing aid case and other components are, for simplicity, not shown in Figure 10.

Throughout the drawing the same numerals refer to corresponding parts of the apparatus.

Referring to Figure 1 there is illustrated a hearing aid generally designated 10 shown attached to the ear of the human wearer. This hearing aid includes a body portion 11 and a detachable horn 12 which is attached at its small end to a clear flexible plastic tube 13 that in turn is attached to a plastic "earmold" 14 that is individually fitted to the wearer. The horn 12 is tapered and is press-fitted to tubular bars 29 on case 11, see Figures 6 and 7. The horn 12 is composed of a plastic material such as polyethylene plastic and has a moderate amount of flexibility, a good smooth "feel" and due to such flexibility is easily attached by frictional engagement to the harder plastic case, as shown particularly in Figures 6 and 7 to which reference will be made. The horn 12 has a tapered hole 62 through it for conducting the sound and the exterior of the horn also tapers out to end 64, where provision is

333



made for receiving the plastic tube 13, slipped to the end 64.

In Figure 1 the hearing aid 10 is shown attached to the left ear of the wearer but it will be understood that the apparatus may be made in either a "right" or "left" form and used for either ear of the wearer. The hearing aid is entirely self-contained and needs no exterior battery supply or microphone. The horn 12 may be made in the form shown in Figure 1, in which no provision is made to attach it to a cut-off end of a spectacle bow, or it may be provided with a boss 12A having hole 12B in it for fitting to the bow B of a spectacle as in Figures 2 and 6.

Thus in Figure 2 the hearing aid 10 and body portion 11 are identical to those shown in Figure 1 but the horn 12 has a protuberance 12A which is cast integral with the horn 12. This protuberance is apertured at 12B for a moderate depth, so as to receive the stiffening wire W which is normally used in the bow B of the spectacle S, as shown in Figure 2. The only necessity for fitting the horn 12 to a pair of spectacles is to snip off the spectacle bow, and strip back the plastic portion. The protruding wire W of the bow is then pushed into the aperture 12B. Any suitable adhesive is used to then cement the wire reinforcement W into the aperture 12B and the horn 12 is accordingly attached to the spectacle bow B and is carried therewith. This in effect makes the hearing aid 10 a part of the spectacle, by mere attachment thereto, added stability of wearing is thereby provided. However it should be understood that the hearing aid may be worn with sufficient stability as shown in Figure 1 because the horn 12 encircles the top of the ear and the hearing aid body 11 fits as a suspended unit closely behind the ear of the wearer. The small plastic tube 13 comes down in front of the ear and curls into and is attached to the earmold 14. While the tube 13 has some degree of flexibility and the horn 12 has a slight degree of flexibility, particularly towards its small end where it is attached to the tube 13, nevertheless the earmold attachment and the entire configuration of the unit serves to hold the unit with remarkable and entirely sufficient attachment to the ear of the wearer as shown in Figure 1, even where no attachment is made to a spectacle bow. Some users prefer the form of attachment shown in Figure 2 where the horn 12 is attached to the bow of the spectacle but this is not required for complete stability of the unit or for wearer comfort.

The horn 12 may be made as a solid boss and the portion 12A may be left unbored, and the agent who fits the hearing aid will then drill out the protuberance 12A to fit the diameter of the reinforcing wire W in the spectacle bow B, if that type of spectacle is to be attached thereto, or where a spectacle of the type having a metallic bow is used the protuberance 12A may be drilled to fit the particular diameter size of the spectacle bow wire and the latter may then be cemented firmly in place.

Referring particularly to Figures 3 through 9 the case 11 is a plastic molding formed so as to provide an interior space 16 which is of maximum depth throughout the portion from the bottom wall 17 to the wall 18 which defines the surface against which the sound reproducer 19, encased in a very soft rubber or plastic receptacle 20 is adapted to be positioned as shown in Figures 6, 7 and 8. The shape of the interior space 16, as viewed in Figure 6, is defined by the rear wall 21, the bottom wall 17, the wall 22, which is the surface that is normally adjacent the ear of the wearer, and the interior corner 18. The upper portion of the plastic molding 11 is then provided with a pocket at 24 which extends from the interior corner 18 and between the two walls 25 and 26 to the shoulders 27—27 and then extends into a pocket of smaller width at 28—28. Finally this smaller pocket terminates at a tubular nipple at 29 having an axial hole 30 therein. The tubular nipple connects with a pocket of corresponding size in the horn 12 and the horn has a push fit onto and

seats on the nipple 29 and against the surface 32 of the plastic case. Adhesive may be used to hold the horn 12 attached to the case 11 at the nipple 22 and surface 32 if desired although normally the slight flexibility of the plastic of which the horn 12 is made is sufficient to provide a lasting gripping action sufficient to hold both parts together.

The aperture 16 is provided with an interior boss 34 at one corner into which there is molded a metallic screw anchor 35. This boss 34 provides a surface 34A upon which a battery frame generally designed 36 is adapted to be mounted by means of the screw stud 37 which serves as a pivot about which the frame 36 may be swung from the position shown in Figure 7 to the position shown in Figure 6. In the position shown in Figure 7 the frame 36 holds the battery 38 in electrical contact with appropriate contacts within the hearing aid case 11 and hence provides the electrical supply for the hearing aid apparatus. When the frame 36 is swung to the position of Figure 6 the battery 38 can be taken out by deflecting the frame 36 and case 11 a little, as shown in Figure 9, but battery 38 will not fall out of its own accord. It may be noted parenthetically that a single mercury type cell forms the battery 38 and this provides sufficient power to energize the transistor amplifier circuits of this hearing aid apparatus.

The transistor amplifier is mounted upon a printed circuit board 40 which is anchored in place by an enlarged head 37A on the same stud 37 which holds the battery frame 36 in place in the apparatus. The stud 37 is provided with a screw threaded aperture 37B at its outer end to which a screw 41 may be attached for holding one corner of the removable cover 42 in place on that side of the case 11 which normally contacts the head of the ear. Other corners of the case are held by screws 43—43 which are entered into the metallic brackets 44 and 45 at the lower end of the housing, these brackets being provided with screw fitted apertures at 44A and 45A. The brackets 44 and 45 also serve as electrical connectors to a rheostat and switch 46 having a disc-like control knob 47. The brackets have a shape shown in Figure 8 and are riveted at 49 to the printed circuit board 40 and support the board 40 in the case 11.

Also there are a plurality of circuit components shown opposite the bracket 50, on the right side of the printed circuit board 40 as shown in Figure 8. These individual circuit components include the transistor, condensers, resistors, etc. making up the multiple stage transistor amplifier circuit of the hearing aid. In the hearing aid assembly when the circuit board 40 is held in place as illustrated, there is a space behind it as shown in Figure 6, and to the left of the element 40 as shown in Figure 8. It is into this space, which is illustrated in Figure 7, that the battery frame 36 swings and carries the battery 38 and thus brings the battery into position so as to form its electrical contact with the suitably disposed contact pieces on the hearing aid board 40 and elsewhere within the space 16. At the bottom of this space there is also the microphone apparatus 52 which is entirely encased in magnetic material 53. The magnetic sheath 53 is made in the form of two pans which nest together as shown in Figure 10, and enclose the entire microphone except for openings as at 54 through which the electrical connections emerge from the microphone 52. The sheath 53 is of highly permeable magnetic material but the sheath is quite thin and the sound waves, which enter the case portion 11 through a small opening 55, see Figure 3, impinge against the adjacent flat surface of the microphone case metal 53 and by vibrating such case serve to operate the microphone 52 which is entirely encased by the metal case 53. The effect of this is that while the mechanical force of the sound waves are permitted to operate the microphone without substantially decreasing their effect in passing through the

834

case 53, still at the same time any magnetic disturbance in the region of the microphone 52 is shielded away from the microphone by means of the magnetically permeable metal forming the case 53. This serves to reduce that kind of noise interference which has been found to be due to the proximity of the hearing aid to electrical apparatus such as fluorescent lights, etc.

Referring to Figures 6-9 particularly, it will be noted that the frame 36 which serves as a swinging mounting for the battery 38 has a maximum thickness at the wall portion 36A which is exposed to the rear of the hearing aid case 11 when the frame 36 is swung closed as shown in Figures 4 and 7. This wall portion 36A terminates as a small projection 36B at the corner opposite the pivot screw 11 and the user may accordingly insert a fingernail behind the portion 36B for swinging the frame 36 outwardly to the position shown in Figure 6. The frame portion 36A is of slightly narrower width at the corner and the small aperture 56 in the rear wall of the hearing aid case 11 is likewise somewhat narrowed at its upper portion 56A. The remainder of the frame 36 is considerably thinner and forms a ring 36D, which is displaced to the position shown in Figure 8. Accordingly, the battery, which has a larger diameter flange 38A at one face, may seat with one portion of the battery case positioned in the ring 36D and the flange 38A resting on the surface of the ring. When the frame 36 is swung to its outward limiting position as shown in Figure 6 a certain portion of the battery 38 is still situated within the opening 56 and the battery 38 will therefore not simply fall out of the frame 36. This is an advantage for some users of hearing aids, particularly older people, may swing the frame 36 to its open position, either through curiosity or a misbelief that the battery is not operating properly, or for other reasons and if the battery 38 is able simply to fall out of the frame 36 when the frame 36 is in an open position, the battery could be easily lost and since it is no larger than a moderate size button, the battery can easily fall and roll to some place where it is irretrievably lost by the user. According to the present invention this problem of lost batteries is obviated, at least in part by making the frame 36 so that, while it permits the removal of the battery by a conscious act, yet the battery does not simply fall out of the frame when the frame 36 is moved to its open position. Hence as shown in Figure 6 and in Figure 9 the battery is ready to be removed but in order to do so the frame 36 must be deflected in the direction of arrow 58 as shown in Figure 9. This is possible due to a slight looseness of fit of the pivot bearing 37 in respect to the frame 36 and also due to the fact that the case 11 and the frame 36 are made of slightly flexible plastic material and the frame 36 when moved to its open position and is then pushed sideways in the direction of arrow 58 will deflect the case 11 a little bit. This provides enough room so that, in the position shown in Figure 9, the battery 38 may be cocked to the position shown in that figure, where the edge 38E is just ready to clear the hole in the battery frame 36 and the battery can then be withdrawn in the direction of the arrow 59. This is not at all difficult to do but it does require a conscious act of the user and in so doing the user is prevented from losing the battery through mere casual or inattentive opening of the battery frame 36.

Referring to Figures 6, 7 and 8, particularly, the sound reproducer or "receiver" 19 may be of the crystal or magnetic type and is enclosed in its usual case. Around the case, however, there is placed a very soft plastic sheath 20 which is in the form of a cup or collar, and is provided with an aperture 60 at one side, in alignment with the sound delivery tube 61 of the sound reproducer 19. Accordingly sound produced by receiver 19 can leave the tube 61 and proceed through the aper-

ture 60 to the aperture 30 in the tubular connection 29 and thence enter the horn 12 and proceed through the gradually tapered curved aperture 62 and be delivered at the connection end 64 where attachment of the horn is made to a plastic tube 13 as previously described. The sound is then conducted through the plastic tube 13 to an "earmold" 14 which is of a shape that fits the external portions of the ear canal of the user.

The very soft plastic or rubber sheath 20 entirely surrounds the sound reproducer 19 and is provided with a flange 66 by which the back side of the sound reproducer is separated from the adjacent portions of the case 11 and the end surface of the hearing aid circuit board 40. Accordingly the mechanical conduction of sound vibrations from the receiver 19 to the microphone 52 are minimized to an unobjectionable degree. At the same time the sound waves delivered by the sound reproducer 19 are sealed by the flange end 67 of the sheath 20 and these are not permitted to travel around through the air within the case to the microphone 52. Accordingly the sound waves are delivered and conducted through a sealed mechanical channel which begins at the sound delivery tube 61 of the sound reproducer 19 and thence enters through the port 30 of the nipple 29 and through the channel 62 of the horn 12 and through the tube 13 to the earmold 14 and being thus delivered directly to a soft portion of the ear canal and in sealed relation to the walls of the canal, very little sound is accordingly transmitted through the open air back to the microphone 52 and the sound reproducer 19 are in close mechanical proximity but with objectionable feedback either mechanically or through the air from the sound reproducer to the microphone.

As many widely apparently different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that I do not limit myself to the specific embodiments herein.

What I claim is:

1. A hearing aid comprising a case of slightly flexible material, a complete sound pickup and amplifier system in said case including a microphone, an electrical sound amplifier, a battery for said sound amplifier, and a sound reproducer, said apparatus being characterized in that said case is provided with a battery holder of generally planar shape attached to the case for movement edge-wise from an operating position where the holder is within the case to a battery changing position where the holder is partially exposed outside of the case, said holder being shaped for receiving said battery therein when the battery is moved in a direction generally normal to the plane of said holder, said holder being shaped so that the battery when held therein is only partially exposed when the holder is moved with reference to the case to the battery changing position, said holder in said position and said case being deflectable relative to each other to a position such that the battery may be cocked to a position out of the plane of said holder and withdrawn from the holder and said case.
2. The hearing aid apparatus specified in claim 1 further characterized in that said battery holder is pivotally mounted on said case for swinging movement from its operating to its battery changing position.
3. The hearing aid apparatus of claim 1 further characterized in that said battery holder includes a small projecting section which overlaps the case when the battery holder is in its operating condition so as to enable the user thereof to insert an object behind said projecting section for operating said battery holder.
4. A hearing aid apparatus comprising a case of material such that magnetic waves may pass therethrough, said case including a complete electrical sound receiving and amplifying system including a microphone, a multiple stage electrical amplifier and a sound reproducer complete with power supply therefor, said apparatus being

835



connected in that the case includes an aperture through which sound vibrations from the exterior may enter the case and further characterized in that said microphone is housed in a sheath of paramagnetic material, said microphone in its sheath being positioned so that a surface of the microphone which normally receives the sound waves thereagainst and which is covered by said sheath is positioned in the case adjacent the aperture therethrough, said paramagnetic material sheath being sufficiently thin adjacent said aperture so as to permit the sound waves to be transmitted directly to the sheath to the microphone within the sheath.

5

10

References cited in the file of this patent

UNITED STATES PATENTS

2,513,746	Rohr	July 4, 1950
2,718,563	Nicholides	Sept. 20, 1955
2,794,085	De Angelis	May 28, 1957

FOREIGN PATENTS

494,016	Italy	May 15, 1954
737,115	Great Britain	Sept. 21, 1955
760,615	Great Britain	Nov. 7, 1956
761,169	Great Britain	Nov. 14, 1956

836

1 FLEHR, MOHRBACH, TEST,  
2 ALBRITTON & HERBERT  
3 ALDO J. TEST  
4 THOMAS O. HERBERT  
5 160 Sansome Street - 15th Floor  
6 San Francisco, California 94104  
7 Telephone: 781-1989

8 Attorneys for defendant

9 IN THE UNITED STATES DISTRICT COURT  
10 FOR THE NORTHERN DISTRICT OF CALIFORNIA

11 THE TELEX CORPORATION, )

12 Plaintiff, )

13 v. )

14 PACIFIC PLANTRONICS, INC., )

15 Defendant. )

Civil Action No. C70 1340 LHB

DEFENDANT'S ANSWERS TO  
INTERROGATORIES

16 COMES NOW defendant, Pacific Plantronics, Inc., and  
17 in response to Plaintiff's Interrogatories to Defendant submits  
18 the following:

25 Interrogatory No. 13: Specify with particularity the  
26 factual basis for the allegations contained in paragraph 8 of  
27 Defendant's answer to the complaint in this lawsuit.

28 Answer: All of the claims of the patent in suit/are<sup>[\*]</sup>  
29 directed to a headset having two features which are clearly not  
30 present in the StarSet. These features are 1.) that the micro-  
31 phone tube extends from the bottom of the housing and the

[\*Note: This has reference to Flygstad et al patent 3,280,273]

837

1 receiver tube extends from the top and 2.) that the microphone  
2 tube lies in contact with the operator's cheek to provide  
3 stability. If these two features are ignored, as they must  
4 be to even find a good faith assertion of infringement in the  
5 StarSet, then the patent in suit teaches nothing more than  
6 locating the housing of defendant's own MS50 behind the ear of  
7 the wearer. This would be an obvious combination of prior art  
8 such as of defendant's patent 3,184,556 (showing the use of  
9 accoustical tubes 26 and 29 connecting the microphone 10 and  
10 receiver 20 of a headset to the mouth and auditory canal of  
11 the wearer) and plaintiff's patent 2,882,348 (showing a hearing  
12 aid using a behind the ear housing for the microphone 52 and  
13 receiver 19 with an accoustical tube 13 connected between the  
14 receiver and the auditory canal of the wearer).

15 Furthermore, if the two above mentioned features are  
16 ignored, each and every claim of the patent in suit reads directly  
17 on plaintiff's own earlier patent No. 2,882,348. Patent No.  
18 2,882,348 differs from the patent in suit only in that the  
19 microphone tube 55 is short and extends sideways from the housing  
20 rather than extending forward to touch the face of the wearer.

838



PACIFIC PLANTRONICS, INC.

By

Courtney P. Graham  
President

State of California )  
City & ) ss.  
County of San Francisco )

COURTNEY P. GRAHAM, being duly sworn, upon his oath  
deposes and says:

1. I am President of Pacific Plantronics, Inc., a  
corporation, and I am the agent of that corporation for the  
purpose of making the above answers to Plaintiff's Interrogatories  
to Defendant, served on ~~the~~ corporation on or about April 30,  
1971 and ~~for~~ making this verification.

2. The foregoing answers to Plaintiff's Interrogatories  
to Defendant are true according to the best of my knowledge,  
information and belief.

Courtney P. Graham

Subscribed and sworn to before me  
this 27th day of May, 1971.

Notary Public

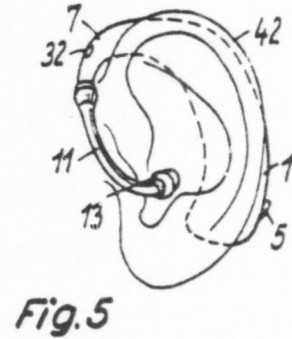
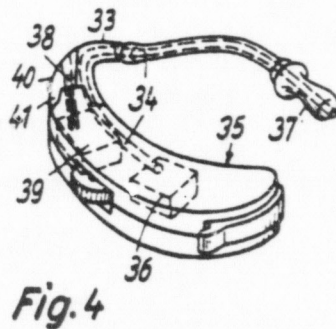
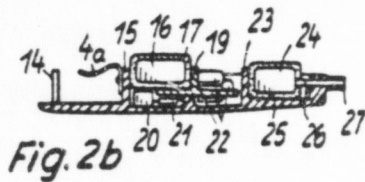
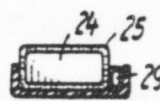
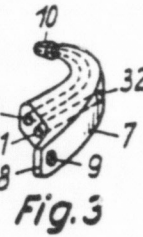
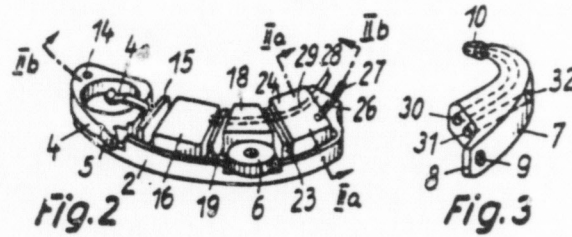
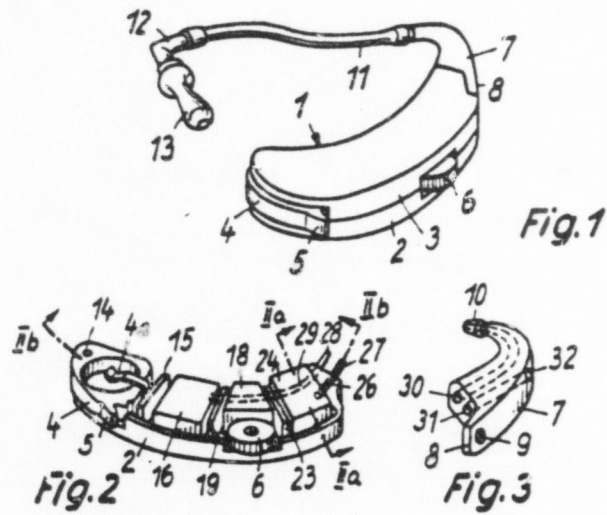
WILLIAM M. DAVIDSON  
My Commission Expires Aug. 16th, 1972

839

Sept. 28, 1965

W. GÜTTNER ET AL.  
ELECTRICAL HEARING AID  
Filed June 29, 1961

3,209,080



840

1

3,209,080  
**ELECTRICAL HEARING AID**  
Werner Güttner and Clemens Starke, Erlangen, and Franz  
Sapara, Erlangen-Bruck, Germany, assignors to Sie-  
mens-Reiniger-Werke Aktiengesellschaft, Erlangen,  
Germany, a corporation of Germany  
Filed June 29, 1961, Ser. No. 120,640  
Claims priority, application Germany, May 12, 1961,  
S 73,924  
7 Claims. (Cl. 179-107)

This invention is concerned with an electrical hearing aid to be worn in back of the ear, comprising a housing containing electrical components including the microphone, amplifier with regulating elements, battery and receiver, and having a bookshaped carrier portion which is free of electrical components, preferably removably connected with the housing and attachable to the upper part of the auricle.

The housing of a hearing aid which is worn in this manner, is thus positioned in back of the ear while the carrier portion extends toward the front of the ear. Accordingly, the microphone, which is disposed in the housing, is at a place lying in back of the ear. The entry or inlet opening through which the sound comes to the microphone is thereby provided as close as possible to the microphone, that is, at a place of the housing which is in back of the ear below and remote from the hooklike carrier. The sound inlet opening, also referred to as the speak-in opening, is thus frontally largely shielded by the auricle and also by the head. This is a disadvantage because sound waves generated in the course of a conversation come to the person who is hard of hearing, from the front and can be received and amplified only along a detour over a path extending in back of the ear.

The invention provides a hearing aid of the initially indicated kind, comprising means forming a sound-conducting line extending contiguous to the sound entry element of the microphone provided in the housing, such line extending to the end of the housing facing the carrier part and continuing in the carrier part or approximately parallel thereto to a microphone sound supply line which terminates in a preferably frontally visible sound inlet opening. This makes it possible that sound waves coming directly from the front can reach the microphone without going over a detour. The person hard of hearing is thus, with the use of the hearing aid according to the invention, in a better position to follow speech which a conversation partner directs at him from the front.

The hearing aid according to the invention comprises, in an exemplary embodiment, a carrier which contains in known manner an acoustic passageway forming the sound exit channel extending from the receiver to the ear piece. In addition, this carrier contains an acoustic passageway forming the sound inlet channel extending to the microphone, such latter channel terminating in the region of the greatest curvature in a frontally visible opening of the convex wall of the carrier. The carrier which is constructed in this manner is advantageously plugged to tubular studs extending respectively from the receiver sound exit line and the microphone sound inlet line forming parts of the housing. The fastening of the carrier on the housing is effected by means of an extension which may be screw connected to the housing.

The receiver is advantageously disposed in the housing about midway of the longitudinal extent thereof and the sound exit line to the ear piece is carried past a narrow side of the microphone which is positioned ahead of the receiver. The sound exit line extending from the receiver is formed by a tubular part which is flattened at least at the portion thereof which passes along the microphone.

2

The flattened portion of this tubular part is thereby positioned in parallel with the narrow side of the microphone, thus providing for a space saving disposition of the sound exit line.

The various objects and features of the invention will appear from the description which will be rendered below with reference to the accompanying drawing showing in perspective representation and in sectional views examples of details of hearing aids constructed according to the invention.

FIG. 1 shows an embodiment of the hearing aid in perspective view;

FIG. 2 shows the housing with the cover detached therefrom;

FIGS. 2a and 2b show sectional views taken respectively along lines IIa—IIa and IIb—IIb in FIG. 2;

FIG. 3 shows the carrier part of the hearing aid illustrated in FIG. 1;

FIG. 4 shows in perspective view an embodiment of a hearing aid wherein the carrier is made of two parts, one part containing only the sound exit line extending from the receiver to the ear piece, while the other part contains the sound inlet line extending to the microphone; and

FIG. 5 shows a hearing aid made in accordance with the invention in its position in connection with the ear.

The accurately shaped housing 1 which is made of synthetic material is constructed of two shells 2 and 3. The housing contains a drawer 4 for receiving the battery, such drawer being pivotally journaled at 14 and being provided with a handle 5. From the convex outer wall of the housing extends part of the sound volume adjusting member 6. At the end of the housing 1 opposite the pivoted drawer 4 is disposed the carrier 7 which is curved booklike and has an extension 8 provided with a hole formed therein (FIG. 3) through which a screw is projected for firmly fastening the carrier to the housing. The carrier terminates in a nipple 10 (FIG. 3) to which is attached a flexible hose 11 carrying an angular member 12 which in turn carries the flexible ear piece 13 to be inserted into the aural opening of the ear.

FIG. 2 shows the shell 2 of the housing with the component parts as they become visible after removal of the shell 3 and detachment therefrom of the carrier 7. Adjacent the battery drawer 4 is a partition 15 carrying the contact spring 4a, followed by the receiver 16 which is wrapped in foam rubber 17 (FIG. 2b). Next to the receiver 16 and partially thereunder are disposed parts of the amplifier 18. The amplifier parts, including also the volume control with the regulator 6, are mounted on a bracket 19. Below the bracket 19, and fastened thereto, are positioned capacitors and resistors which are schematically indicated respectively at 20 and 21, and at the portion of the bracket 19 which is next to the telephone 16, are positioned transistors 22 (FIG. 2b). Next to a partition 23, which delimits the amplifier space, is disposed the microphone 24 which is wrapped in foam rubber 25.

From the microphone 24 extends an acoustic passageway or sound inlet line 16 terminating in a tubular part 27 which projects from the housing. From the receiver 16 extends an acoustic passageway or sound exit line 29 which terminates in a tubular part 28, the latter likewise projecting from the housing. The sound exit line 29 which extends from the receiver 16 to the tubular member 28 is of oval cross-section at the portion thereof which passes along the microphone 24 (see FIG. 2a). The sound exit line 29 through which extend the sound channels 30 and 31, shown in FIG. 3, is plugged to the tubular section members 27 and 28. The sound exit channel 30 leads to the nipple 10 to which is connected the flexible hose 11 leading to the ear piece 13, and the sound inlet channel 31

841



(for the microphone 24) terminates in the sound inlet opening 32.

The hearing aid illustrated in FIG. 4 corresponds substantially to the hearing aid described with reference to FIGS. 1 to 3. The only difference resides in the construction of the carrier, indicated in FIGS. 1 and 3 at 7, which in FIG. 4 is made in two parts, one part 33 containing only the sound exit channel 34 leading from the receiver 36 to the ear piece 37. The sound inlet channel 38 leading to the microphone 39 extends through the other part 40 which is fastened to the housing 35 by means of an extension 41. The part 40 can also be constructed as a tube which is screw connected with the connecting tube 27 (FIGS. 2 and 2b), it being of course assumed that appropriate threads are provided for this purpose.

As will be seen from FIG. 5, the housing (1 in FIG. 1 or 35 in FIG. 4) is in operation positioned in back of the ear 42 while the carrier 7 (33, 40 in FIG. 4) extends forwardly of the ear 42. The sound inlet opening 32 (opening of inlet channel 38 in FIG. 4) thus comes to lie at a point which is in the use of the hearing aid directed toward the front. Sound waves directed toward the person wearing the hearing aid can accordingly directly enter at the sound inlet opening such as 32 for direct propagation without any detour, to the microphone 24 over the lines 31 and 26 (FIGS. 2 and 3) or to the microphone 39 over the line 38 (FIG. 4). The microphone converts the sound waves into electrical signals which are amplified in the amplifier such as 18 (FIG. 2) and made audible again in the receiver such as 16 in FIG. 2 or 36 in FIG. 4. The amplified sound waves are in FIGS. 1-3 conducted to the aural passage of the ear 42 over the line 29, channels 30, 11, and through the ear piece 13, while being in FIG. 4 conducted to the aural passage over the lines 34 and the ear piece 37.

Changes may be made within the scope and spirit of the appended claims which define what is believed to be new and desired to have protected by Letters Patent.

We claim:

1. An electrical hearing aid comprising a housing constructed to be disposed and worn behind the ear, said housing containing components including a battery, a microphone, an amplifier with regulation means and a receiver, a hooklike curved carrier free of electrical components, which is to be worn upon the upper part of the auricle, means forming an elongated tubular acoustic passageway for conducting sound waves from exteriorly the housing to said microphone, said acoustic passageway terminating at its outer end in a frontally directed opening near the upper part of the auricle when the hearing aid is worn, with said acoustic passageway extending rearwardly over the auricle to said microphone.

2. An electrical hearing aid comprising a housing constructed to be worn behind the ear, said housing containing components including a battery, a microphone, an amplifier with regulation means and a receiver, a hooklike curved carrier free of electrical components, which is to

be worn upon the upper part of the auricle, means for removably connecting said carrier with said housing, said housing having an elongated tubular acoustic passageway formed therein for conducting sound waves to said microphone, said carrier having an elongated tubular acoustic passageway formed therein communicating at its connection end with the free end of said first-mentioned passageway, and terminating at its opposite end in a frontally directed and frontally visible sound inlet opening, said second-mentioned passageway extending rearwardly over the auricle to said first-mentioned passageway.

3. A hearing aid according to claim 2, comprising a bracketlike portion extending from said carrier for mounting the carrier in assembly with the housing.

4. A hearing aid according to claim 2, wherein said second-mentioned acoustic passageway terminates in a sound inlet opening in the portion of the wall of said hook-like carrier which has the greatest convex curvature, said carrier also having a tubular acoustic passageway formed therein which communicates at one end, with the receiver and at the opposite end with the ear piece of the device.

5. A hearing aid according to claim 4, comprising means forming a tubular acoustic passageway for conducting sound waves from said receiver, tubular studs extending from the housing and communicating respectively with the line to said microphone and the line from said receiver, said studs extending in assembled position of said carrier into the respective acoustic passageways formed therein.

6. A hearing aid according to claim 4, wherein the receiver is disposed in said housing within a centrally extending region thereof while the microphone is disposed therein near the end thereof facing said carrier, and means forming an acoustic passageway extending from said receiver alongside a narrow side of said microphone to the ear piece of said hearing aid.

7. A hearing aid according to claim 6, comprising a tubular member disposed in said housing and forming said acoustic passageway from the receiver, said tubular member being flattened at least for the portion thereof which passes along the narrow side of said microphone, with the long cross sectional axis of said flattened portion extending in parallel with said narrow side.

#### References Cited by the Examiner

##### UNITED STATES PATENTS

2,882,348	4/59	Erickson	179-107
2,999,136	9/61	Holt et al.	179-107
3,045,073	7/62	Vickerson	179-107

##### FOREIGN PATENTS

792,742	4/58	Great Britain.
---------	------	----------------

ROBERT H. ROSE, *Primary Examiner*.

STEPHEN W. CAPELLI, *Examiner*.

842

Exclusively from SIEMENS..world's  
first and finest ear-level  
hearing instrument with

TRUE  
FRONTAL  
SOUND  
pick-up

# Siemens AURICULINA

sells ITSELF...

Your clients have dreamed of this natural way to hear sounds—from the front. With Auriculina, "it's what's up front that counts"—the microphone that brings them the nearest approach to normal hearing!

This frontal sound reception cuts out the harshness of the back-ground noises so prevalent with "rear" microphone aids. The resulting hearing has a more pleasant, natural tone.

Auriculina's 50 db average gain provides optimum reception with maximum speech intelligibility, at a minimum of distortion—a new and thrilling experience in hearing happiness.

... because it brings the user:

- \* True Directional Sound
- \* Featherweight Comfort
- \* Operating Simplicity
- \* Quality Construction
- \* Trouble-free Service

... and so it brings you, the dealer:

- \* More Customers
- \* Easier, Quicker Sales
- \* Less Costly Sales
- \* Increased Volume
- \* Greater Profits

GOOD TERRITORIES AVAILABLE TO ESTABLISHED DEALERS

Siemens offers a complete line of ear-level, eyeglass and body-worn hearing instruments backed by ad mats, mailing pieces, point of purchase material and a complete sales and service program.

Patents applied for

"Most people DO hear better with a Siemens — there IS a difference!"

Write, wire, or phone

**PHONOPHOR CORPORATION OF AMERICA**

EXCLUSIVE U.S. DISTRIBUTORS OF SIEMENS HEARING AIDS

99 SOUTH CHESTER AVENUE, PASADENA, CALIFORNIA / MURRAY 1-2371

In Canada contact Mr. Herman Scholz, 1137 Bute Street, Vancouver 5, B. C., Canada

• CU

resident  
microphone wiring  
See Union Carbide  
JOURNAL

laboratory

PHILIPS

president  
vice president  
manager  
advertising manager  
distributors of hearing  
instruments on page

resident  
dent & sales manager  
Lobs, Nos-Ease, &  
aid

resident  
Aid hearing  
NG AID CORP.

resident, secretary  
manager  
manager  
manager of Unit  
instruments on page

aid  
ment on page  
RATORY

resident  
in ear molds

resident  
director  
of hearing

man & managing  
retary & director  
sales director  
advertising director  
hearing aids and  
equipment

HEARING AID

April 1963

843

THE JOURNAL OF  
THE SOCIETY OF HEARING AID AUDIOLOGISTS



1962

Vol. 1

No. 18

844



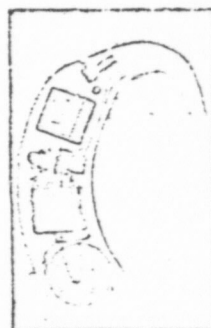


## Here is the AURICULINA TYPE 341

Once more Siemens introduce a new unique top selling aid.

This fabulous new concept of an ear level hearing aid is a worthy addition to the well known range of Siemens Auriculette hearing aids.

The delightful little AURICULINA meets a long felt want. Due to the forward facing sound receptor the user is enabled to select more easily the wanted sounds . . . those from the front, giving clearer, more natural hearing.

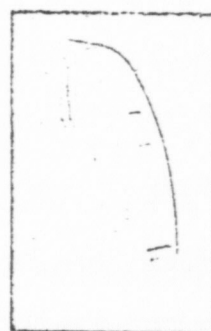


A radiograph  
of the  
AURICULINA

- + Frontal sound receptor
- + Silken tone
- + Slim line
- + Fits the smallest ears

### technical details

Maximum amplification at 1000 c/s  $35 \pm 5$  dB.  
Maximum acoustic output 123 dB  $\pm 4$  dB.  
Battery type RM 675. Battery current: 1.6–2.5 mA.  
See your sales agent with the SIEMENS AURICULINA type 341.



You cannot afford to  
be without this top  
selling instrument.

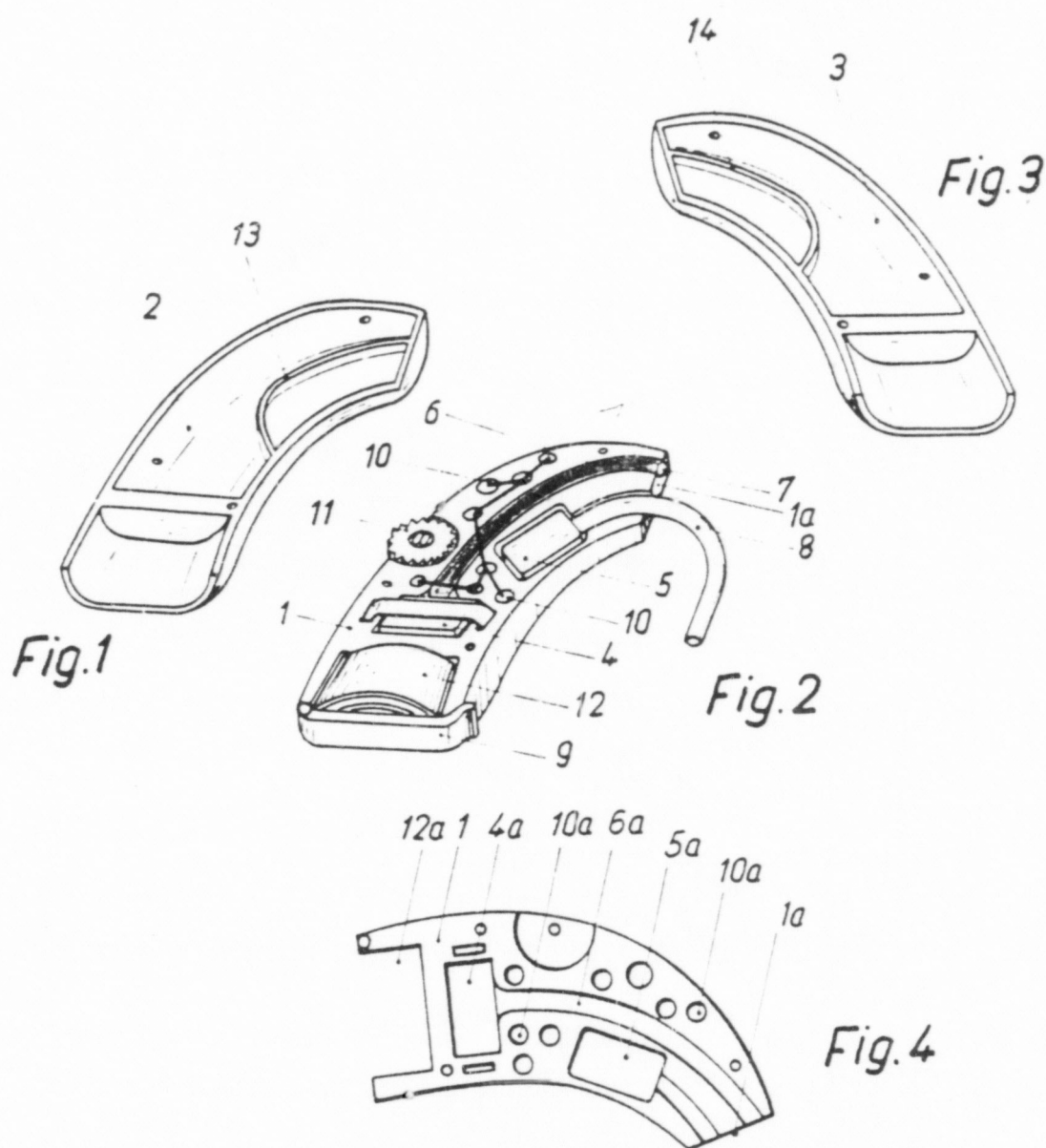
Order now from the sole U.K. distributors.

**HIGHGATE ACOUSTICS,**  
71/73 GREAT PORTLAND STREET, LONDON, W.1.

Tel: MUSEum 2901 6.

Page Thirty-two

845



846



SCIENTIFIC LIBRARY

FEB 18 1953

U. S. PATENT OFFICE

## AUSLEGESCHRIFT 1 139 549

D 36342 VIIIa/21a<sup>2</sup>

ANMELDETAG: 16. JUNI 1951

BEEANNTMACHUNG  
DER ANMELDUNG  
UND AUSGABE DER  
AUSLEGESCHRIFT: 15. NOVEMBER 1952

1

Die Erfindung betrifft ein hinter dem Ohr zu tragendes Schwerhöringerät, bestehend aus einem etwa sichelförmigen oder halbmondförmigen Gehäuse, das die Teile des Gerätes, wie Mikrophon, Verstärker, Hörer, Batterie usw., aufnimmt und in seinem oberen, beim Tragen über dem Ohr liegenden Ende eine Schalleintrittsöffnung für das Mikrophon trägt. Ein derartiges Gerät wirkt recht unauffällig beim Tragen, weil es infolge seiner kleinen, dem Raum hinter der Ohrmuschel angepaßten sichelförmigen Gestalt zum größten Teil durch die Ohrmuschel verdeckt wird. Sichtbar für einen davorstehenden Partner bleibt lediglich oberhalb des Ohrs das obere Ende des sichelförmigen Gehäuses sowie der hier austretende und zur Ohröffnung führende Hörschlauch.

Man ist selbstverständlich bestrebt, das Gerät möglichst klein und unauffällig zu machen. Dieses gilt besonders für die beiden vorhin genannten sichtbaren Partien. Bei der Ausbildung des oberen Endes des sichelförmigen Gehäuses muß man aber auch die akustischen Belange des Gerätes berücksichtigen. Es hat sich nämlich herausgestellt, daß es akustisch günstiger ist, wenn man die Schalleintrittsöffnung für das Mikrophon am oberen Ende des sichelförmigen Gehäuses, und zwar nach vorn gerichtet, anordnet. Einen anderen Platz für die Schalleintrittsöffnung vorzusehen, wie z. B. am unteren Teil des sichelförmigen Gehäuses entweder an dessen unterer Stirnfläche oder an der nach außen liegenden Seitenfläche, ist sehr ungünstig, weil dann die Ohrmuschel die Schalleintrittsöffnung gegen die von vorne kommenden Schallelemente abschirmt. Dadurch wird der Schwerhörige verwirrt, weil er nicht mehr das richtige Empfinden dafür hat, aus welcher Richtung der Schall kommt.

Es erscheint also auf Grund vorstehender Erkenntnisse empfehlenswert, die Schalleintrittsöffnung für das Mikrophon an das obere Ende des sichelförmigen Gehäuses zu legen. Dann müßte man aber auch das Mikrophon selber unmittelbar anschließend an die Schalleintrittsöffnung anordnen, damit man entsprechend der bis jetzt herrschenden Auffassung keine zusätzlichen Verluste an Schallenergie in dieser Schallführung in Kauf zu nehmen braucht. Dies bedeutet aber, daß das obere Ende des sichelförmigen Gehäuses plump, also auffällig wird, was aber gerade vermieden werden sollte.

Aus der Schwierigkeit, daß bei Anordnung der Schalleintrittsöffnung mit anschließendem Mikrophon im oberen Teil des Gehäuses einem akustischen Vorteil ein baulicher Nachteil gegenübersteht und umgekehrt, daß man es bei Anordnung der beiden frag-

Hinter dem Ohr zu tragendes  
Schwerhöringerät

Anmelder:

Robert Bosch Elektronik

Gesellschaft mit beschränkter Haftung,

Berlin und Stuttgart,

Berlin-Wilmersdorf, Forckenbeckstr. 9-13

Horst Dallmann, Berlin-Tegel,  
ist als Erfinder genannt worden

2

lichen Bauteile, nämlich Mikrophon und Schalleintrittsöffnung, an einer anderen Stelle des Gehäuses mit einem baulichen Vorteil gegenüber einem akustischen Nachteil zu tun hat, gibt es einen Ausweg, wenn man gemäß der Erfindung das Mikrophon in dem Gehäuse so weit entfernt von der Schalleintrittsöffnung anordnet, daß zwischen dem Mikrophon und der Schalleintrittsöffnung vorhandener Raum für die Unterbringung anderer Teile des Gerätes, z. B. des Hörers und/oder der Schaltelemente des Verstärkers, ausgenutzt wird, und man das Mikrophon mit der Schalleintrittsöffnung durch eine als Schallführung dienende Schlauchleitung verbindet.

Es hat sich nämlich herausgestellt, daß entgegen der bisherigen Auffassung durch die Einfügung einer Schlauchleitung zwischen Mikrophon und Schalleintrittsöffnung durchaus keine Übertragungsverluste der Schallenergie eintreten, sondern daß im Gegenteil sowohl die Empfindlichkeit des Gerätes größer wird als auch die Frequenzdurchlaßkurve besser liegt. Der Erfinder konnte bisher nicht mit Sicherheit feststellen, worauf diese Verbesserung der akustischen Verhältnisse zurückzuführen ist. Möglicherweise beruht sie auf der an und für sich bekannten Tatsache, daß es günstiger ist, den Luftraum innerhalb des Mikrophons erst mit dem Luftraum der Schlauchleitung in Wechselwirkung treten zu lassen, als daß man bei Fehlen der Schlauchleitung den Luftraum des Mikrophons unmittelbar mit dem unendlich großen Luftraum der Umgebung in Verbindung bringt.

209 701/723

847



Man kann nunmehr ohne weitere Nachteile die Schalleintrittsöffnung an das obere Ende des sichelförmigen Gehäuses legen, ohne daß man das Mikrophon direkt daneben, also ebenfalls am oberen Ende unterbringen muß; man hat es dadurch in der Hand, das obere Ende des Gehäuses, das sich ja oberhalb des Ohres befindet und deutlich sichtbar ist, sehr schlank und unauffällig zu machen. Darüber hinaus wird die Charakteristik des Mikrophons eindeutig verbessert.

Hat man einmal festgestellt, daß bestimmte, zunächst aus räumlichen Gründen projektierte Abmaße der Schlauchleitung zwischen Mikrophon und Schalleintrittsöffnung akustisch günstig sind, so spielt die Lage dieser Schlauchleitung keine ausschlaggebende Rolle.

Die Leitung kann nach einem Merkmal der Erfindung entweder vollständig im Inneren des Gehäuses verlaufen oder wenigstens teilweise auf der Außenseite des Gehäuses.

Bei der Festlegung der Abmaße für die Schlauchleitung, wie Länge und Querschnitt, ist aber auch die Formgebung der am offenen Ende dieser Schlauchleitung befindlichen Schalleintrittsöffnung zu berücksichtigen. Je nach den durch die Größe der Lufträume im Mikrophon und in der Schlauchleitung bedingten akustischen Verhältnissen kann es zweckmäßig sein, das offene Ende der Schlauchleitung unmittelbar die Schalleintrittsöffnung bilden zu lassen, wobei die Öffnung einen im wesentlichen mit der übrigen Schlauchleitung übereinstimmenden Querschnitt haben kann, oder man kann das offene Ende der Schlauchleitung trichterförmig oder in ähnlicher Weise erweitern. Unter Umständen und entgegen aller Erwartung kann sogar eine Verengung von Nutzen sein.

Der Träger des Schwerhöringerätes, dessen Schalleintrittsöffnung oberhalb des Ohres liegt, wird nur dann ein dem natürlichen Hören angenähert entsprechendes Richtungsempfinden haben, wenn nach einem Merkmal der Erfindung die Richtung der von dem offenen Ende der Schlauchleitung gebildeten Schalleintrittsöffnung beim Tragen des Gerätes hinter dem Ohr mit der normalen Blickrichtung des Trägers einen Winkel von weniger als 30 Grad einschließt.

Dadurch, daß das Schwerhöringerät hinter dem Ohr eine bestimmte Lage hat und in dieser Lage durch den Hörschlauch gehalten wird, der von dem in dem sichelförmigen Gehäuse eingebauten Hörer kommend dieses Gehäuse in seinem oberen Teil verläßt und zu dem in den Gehörgang eingesteckten Ohrstück führt, ist auch die Einhaltung der einmal für die Schalleintrittsöffnung als günstig erkannten Richtung, nämlich der normalen Blickrichtung des Trägers, gewährleistet.

Es ist bekannt, ein hinter dem Ohr zu tragendes Schwerhöringerät so aufzubauen, daß es aus drei Baugruppen besteht, nämlich einem plattenförmigen Mittelteil, das mit Bohrungen und Ausnehmungen zur Aufnahme der Teile des Gerätes versehen ist, und zwei, auf die beiden Flächen des Mittelteiles aufgesetzten Deckschalen. Diese Anordnung hat sich sehr bewährt und kann auch zur Durchführung des Erfindungsgedankens beibehalten werden. Zur Aufnahme der Schlauchleitung zwischen Mikrophon und Schalleintrittsöffnung kann vorteilhafterweise auf einer Fläche des plattenförmigen Mittelteiles eine Rinne vorgesehen werden.

Damit innerhalb des von dem Gehäuse umschlossenen Raumes die vom Hörer abgestrahlte Schallenergie nicht ungünstig auf das Mikrophon einwirkt, ist nach einem weiteren Merkmal der Erfindung zwischen den beiden Flächen des plattenförmigen Mittelteiles einerseits und der Innenseite der Deckschalen andererseits mindestens je eine den Hörer vom Mikrophon trennende Dichtung angebracht, die den vom Hörer abgestrahlten Luftschall in einem solchen Maße von dem Mikrophon fernhält, daß ein selbstständiges Anschwingen oder eine Selbstregung des Gerätes nicht eintreten kann.

Um die volle Verstärkung des Gerätes auszunutzen zu können, dürfen vom Hörer keine Schallwellen direkt auf das Mikrophon gelangen. Die Abdichtung muß also möglichst wirksam sein und kann zweckmäßigerweise durch an der Innenseite der Deckschalen und/oder auf dem plattenförmigen Mittelteil angeformte Rippen gebildet werden. Statt der Rippen kann auch schalldämpfendes Material genommen werden, das zwischen das plattenförmige Mittelteil und die Deckschalen gelegt ist. Natürlich kann man auch beides kombinieren und bei Anordnung von Rippen den etwa noch vorhandenen Luftspalt durch schalldämpfendes Material ausfüllen.

Weitere Einzelheiten der Erfindung seien an Hand der Zeichnungen erläutert, die in vergrößertem Maßstab ein Ausführungsbeispiel des Gerätes darstellen.

Fig. 1 bringt eine perspektivische Ansicht der unteren Deckschale, die vom plattenförmigen Mittelteil abgenommen und danebengelegt ist.

Fig. 2 gibt in perspektivischer Ansicht das plattenförmige Mittelteil mit sämtlichen Einbauteilen wieder.

Fig. 3 ist eine perspektivische Ansicht der oberen Deckschale, vom plattenförmigen Mittelteil abgenommen und umgeklappt.

Fig. 4 zeigt das plattenförmige Mittelteil, die Einbauteile herausgenommen.

Das hinter dem Ohr zu tragende Schwerhöringerät wird nach außen begrenzt durch die beiden Deckschalen 2, 3, deren Form aus den Fig. 1 bzw. 3 zu ersehen ist, ferner durch drei Seitendflächen des plattenförmigen Mittelteiles 1, dessen oberes Ende 1a in der Gebrauchslage des Gerätes ungefähr senkrecht steht, und schließlich durch die am unteren Ende des plattenförmigen Mittelteiles schwenkbar angebrachte Abschlußklappe 9 für die Batterie 12. Die beiden Deckschalen können mittels mehrerer Schrauben auf den beiden Flächen des plattenförmigen Mittelteiles befestigt werden.

In den Ausnehmungen und Bohrungen des plattenförmigen Mittelteiles 1 sind die Teile des Gerätes untergebracht und untereinander mit Leitungen verbunden, die beim Aufsetzen der beiden Deckschalen 2, 3 in deren Hohlräumen Platz finden.

Im einzelnen ist in der Ausnehmung 4a das Mikrophon 4 mittels eines Gummibandes elastisch aufgehängt und mit der in der Rinne 6a ruhenden Schlauchleitung 6 verbunden, deren anderes Ende die Schalleintrittsöffnung 7 bildet. Diese ist im vorliegenden Ausführungsbeispiel einfach das offene Ende der Schlauchleitung.

In der Ausnehmung 5a ist auf in der Zeichnung nicht dargestellte Weise der Hörer 5 befestigt, dessen Schallenergie über den Hörschlauch 8 in das Ohr geführt wird. In den Bohrungen 10a des plattenförmigen Mittelteiles 1 finden die elektrischen Teile 10 des Verstärkers, wie z. B. Widerstände, Kondens-

1 139 549

5

stören usw. Aufnahme. In der Ausnehmung 12a ist die Batterie 12 untergebracht, und für den Lautstärkeregel 11 ist eine tiefe Mulde in dem plattenförmigen Mittelteil vorgesehen.

Die auf den Deckschalen 2, 3 angebrachten Abdichtungsrippen 13, 14 liegen beim Aufsetzen der Deckschalen auf den Flächen des plattenförmigen Mittelteils direkt auf und halten die Schallwellen des Hörers 5 vom Mikrophon 4 fern.

Selbstverständlich ist die Erfindung nicht auf das dargestellte und erläuterte Ausführungsbeispiel beschränkt, sondern kann grundsätzlich auch auf alle anderen für hinter dem Ohr zu tragende Bauformen verwendet werden.

#### PATENTANSPRÜCHE:

1. Hinter dem Ohr zu tragendes Schwerhörigengerät, bestehend aus einem etwa sichel- oder halbmondförmigen Gehäuse, das die Teile des Gerätes, wie Mikrophon, Verstärker, Hörer, Batterie usw. aufnimmt und in seinem oberen, beim Tragen über dem Ohr liegenden Ende eine Schalleintrittsöffnung für das Mikrophon trägt, dadurch gekennzeichnet, daß das Mikrophon in dem Gehäuse so weit entfernt von der Schalleintrittsöffnung angeordnet ist, daß zwischen dem Mikrophon und der Schalleintrittsöffnung vorhandener Raum für die Unterbringung anderer Teile des Gerätes, z. B. des Hörers und oder der Schaltelemente des Verstärkers, ausgenutzt wird, und daß das Mikrophon mit der Schalleintrittsöffnung durch eine als Schallführung dienende Schlauchleitung verbunden ist.
2. Schwerhörigengerät nach Anspruch 1, dadurch gekennzeichnet, daß die Schlauchleitung vollständig im Innern des Gehäuses verläuft.
3. Schwerhörigengerät nach Anspruch 1, dadurch gekennzeichnet, daß die Schlauchleitung wenigstens teilweise auf der Außenseite des Gehäuses verläuft.
4. Schwerhörigengerät nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß das offene Ende der Schlauchleitung unmittelbar die Schalleintrittsöffnung ist.
5. Schwerhörigengerät nach Anspruch 4, dadurch gekennzeichnet, daß das als Schalleintrittsöffnung dienende offene Ende der Schlauchleitung einen im wesentlichen mit der übrigen

6

Schlauchleitung übereinstimmenden Querschnitt hat.

6. Schwerhörigengerät nach Anspruch 4, dadurch gekennzeichnet, daß das offene Ende der Schlauchleitung gegenüber der übrigen Schlauchleitung trichterförmig oder in ähnlicher Weise erweitert ist.

7. Schwerhörigengerät nach Anspruch 4, dadurch gekennzeichnet, daß das offene Ende der Schlauchleitung etwas verengt ist.

8. Schwerhörigengerät nach einem oder mehreren der Ansprüche 1 bis 7, dadurch gekennzeichnet, daß die Richtung der von dem offenen Ende der Schlauchleitung gebildeten Schalleintrittsöffnung beim Tragen des Gerätes hinter dem Ohr mit der normalen Blickrichtung des Trägers einen Winkel von weniger als 30° einschließt.

9. Schwerhörigengerät nach einem oder mehreren der Ansprüche 1 bis 8, bestehend aus drei Baugruppen, nämlich einem plattenförmigen Mittelteil, das mit Bohrungen und Aussparungen zur Aufnahme der Teile des Gerätes versehen ist, und aus zwei, auf die beiden Flächen des Mittelteils aufgesetzten Deckschalen, dadurch gekennzeichnet, daß auf einer Fläche des plattenförmigen Mittelteils eine Rinne zur Aufnahme der Schlauchleitung vorgesehen ist.

10. Schwerhörigengerät nach Anspruch 1 bis 3 und 9, dadurch gekennzeichnet, daß zwischen den beiden Flächen des plattenförmigen Mittelteils einerseits und der Innenseite der Deckschalen andererseits mindestens je einen den Hörer vom Mikrophon trennende Dichtung angebracht ist, die den vom Hörer abgestrahlten Luftschall in einem solchen Maße von dem Mikrophon fernhält, daß ein selbstständiges Anschwingen oder eine Selbsterregung des Gerätes nicht eintreten kann.

11. Schwerhörigengerät nach Anspruch 10, dadurch gekennzeichnet, daß die Dichtung durch an der Innenseite der Deckschalen und oder auf dem plattenförmigen Mittelteil angeformte Rippen gebildet ist.

12. Schwerhörigengerät nach Anspruch 10, dadurch gekennzeichnet, daß die Dichtung durch zwischen dem plattenförmigen Mittelteil und der Deckschalen gelegtes schalldämpfendes Material gebildet ist.

Hierzu 1 Blatt Zeichnungen

© 268 187/225 11. 62

849

Federal Republic of Germany  
German Patent Office  
Provisional patent 1,139,549

Class 21 a<sup>2</sup> 17/03  
Internat. Cl. H 04 m

D 36342 VIIIA/21a<sup>2</sup>

Filing date: June 16, 1961

Application made public and  
provisional patent issued;  
November 15, 1962

Hearing aid to be worn behind the ear

Applicant: Robert Bosch Elektronik Gesellschaft mit beschränkter Haftung,  
Berlin and Stuttgart,

Berlin-Wilmersdorf, Forckenbeckstr. 9-13

Horst Dallmann, Berlin-Tegel, has been named as the inventor

The invention relates to a hearing aid to be worn behind the ear, consisting of a more or less sickle- or crescent-shaped housing, which receives the parts of the instrument, such as microphone, amplifier, earphone, battery, etc., and carries its upper end, lying over the ear when the instrument is worn, a sound inlet opening for the microphone. Such an instrument is quite inconspicuous when worn because, due to its small, sickle-shaped form adapted to the space behind the auricle, it is covered for the most part by the auricle. Visible to a partner standing in front is only, above the ear, the upper end of the sickle-shaped housing as well as the bearing tube emerging therefrom and leading to the ear opening.

Naturally one tries to make the instrument as small and inconspicuous as possible. This applies in particular to the two visible portions just mentioned. In the design of the upper end of the sickle-shaped housing, however, one must take into consideration also the acoustic factors of the housing. It has in fact been found that it is acoustically more favorable to arrange the sound inlet opening for the microphone at the upper end of the sickle-shaped housing, namely directed forward. To provide a different place for the sound inlet opening, as for example at the lower part of the sickle-shaped housing, either at its lower front face or at the lateral face located toward the outside, is very unfavorable because then the auricle shields the sound inlet opening against the

850



sonic events coming from the front. This confuses the hard-of-hearing, because he no longer has the right feeling what direction the sound comes from.

Because of the above findings, therefore, it appears desirable to place the sound inlet opening for the microphone at the upper end of the sickle-shaped housing. But then it would be necessary also to arrange the microphone itself directly contiguous to the sound inlet opening, in order that, according to the opinion prevailing until now, one does not have to accept additional losses of acoustical energy in this sound conduction. But this means that the upper end of the sickle-shaped housing becomes plump, that is, conspicuous, which is exactly what was to be avoided.

From the difficulty that if the sound inlet opening with following microphone is arranged in the upper part of the housing an acoustical advantage is offset by a structural disadvantage, and conversely, that if the two parts in question, namely microphone and sound inlet opening, are arranged at a different point of the housing one is dealing with a structural advantage opposed by an acoustical disadvantage, there is a way out if according to the invention the microphone in the housing is arranged so far away from the sound inlet opening that space present between the microphone and the sound inlet opening is utilized for the accommodation of other parts of the instrument, e.g. of the earphone and/or the circuit elements of the amplifier, and the microphone is connected with the sound inlet opening by a tube line serving as sound conduction.

It has in fact been found that, contrary to the previous opinion, transmission losses of the acoustical energy do not at all occur by the insertion of a tube line between microphone and sound inlet opening, but that on the contrary the sensitivity of the instrument becomes greater and the frequency transmission curve is better. The inventor has not been able until now to ascertain with certainty what this improvement of the acoustical conditions is attributable to. It may possibly be due to the fact, known in itself, that it is more favorable to let the air space within the microphone interact with the air space of the tube line rather than connecting the air space of the microphone directly with the infinitely large air space of the surrounding when there is no tube line.

851

It is now possible without further disadvantages to place the sound inlet opening at the upper end of the sickle-shaped housing without having to arrange the microphone directly alongside, that is, also at the upper end; it is therefore possible to make the upper end of the housing, which is above the ear and is clearly visible, very slender and inconspicuous. Moreover, the characteristics of the microphone is definitely improved.

Once it has been established that certain dimensions of the tube line between microphone and sound inlet opening, which had originally been planned for spatial reasons, are acoustically favorable, the position of this tube line is no longer a decisive factor. The line can, according to a feature of the invention, extend either entirely in the interior of the housing or at least partially on the outside of the housing.

When fixing the dimensions for the tube line, such as length and cross section, also the form of the sound inlet opening at the open end of this tube line must be taken into consideration. Depending on the acoustical conditions caused by the size of the air spaces in the microphone and in the tube line, it may be expected to let the open end of the tube line form the sound inlet opening directly, letting the opening have a cross-section substantially concordant with the rest of the tube line, or the open end of the tube line may be widened like a funnel or in a similar manner. Sometimes, contrary to all expectation, even a constriction may be of advantage.

The wearer of the hearing aid, whose sound inlet opening lies above the ear, will have a directional perception approximately corresponding to natural hearing only if, according to a feature of the invention, the direction of the sound inlet opening formed by the open end of the tube line forms with the wearer's normal viewing direction an angle of less than 30 degrees when the instrument is worn behind the ear.

Due to the fact that the hearing aid has a certain position behind the ear and is held in this position by the hearing tube which, coming from the earphone installed in the sickle-shaped housing, leaves this housing in its upper part and leads to the ear-piece inserted in the aural passage, also the maintenance of

352

the direction once found favorable for the sound inlet opening, namely the normal viewing direction of the wearer, is insured.

It is known how to construct a hearing aid to be worn behind the ear so that it consists of three modules, namely a plate-shaped middle part provided with bores and cutouts to receive the parts of the instrument, and two cover shells applied on the two faces of the middle part. This arrangement has proved very successful and can be retained for the practice of the inventive idea. To receive the tube line between microphone and sound inlet opening, a groove may be provided advantageously on one face of the plate type middle part.

In order that the acoustic energy radiated from the earphone within the space enclosed by the housing will not have an adverse effect on the microphone, there is provided between the two faces of the plate-shaped middle part on the one hand and the inside of the cover shells, on the other, according to the invention, at least one seal separating the earphone from the microphone which keeps the air-borne sound radiated from the earphone away from the microphone to such an extent that self-excitation of the instrument or self-buildup cannot occur.

To be able to utilize the full amplification of the instrument, no sound waves must get from the earphone directly to the microphone. The insulation, therefore, must be as effective as possible and can be obtained expediently by ribs molded to the inside of the cover shells and/or on the plate-type middle part. Instead of the ribs, sound-damping material may be taken, placed between the plate type middle part and the cover shells. Naturally, both may be combined, and if ribs are provided, any remaining air gap may be filled up with sound-damping material.

Further details of the invention will now be explained with reference to the drawings, which illustrate on an enlarged scale an embodiment of the instrument.

Fig. 1 gives a perspective view of the lower cover shell, which has been removed from the plate type middle part and placed next to it;

Fig. 2 gives a perspective view of the plate type middle part with all installation parts;

Fig. 3 is a perspective view of the upper cover shell, lifted off the plate type middle part and flapped over;

853



Fig. 4 shows the plate type middle part, with the installation parts taken

The hearing aid to be worn behind the ear is limited to the outside by the cover shells 2, 3, the form of which can be seen from Fig. 1 and 3, respectively further by three side faces of the plate type middle part 1, whose upper end is approximately vertical in the position in which the instrument is used, and finally by the end flap 9 pivotably provided at the lower end of the plate type middle part, for the battery 12. The two cover shells may be secured on the faces of the plate type middle part by means of several screws.

In the cutouts and bores of the plate type middle part 1 the parts of the instrument are housed and interconnected by lines, which when the two cover shells 2, 3 are placed on, find room in the cavities thereof.

Specifically, in cutout 4a the microphone 4 is elastically suspended by means of a rubber band and connected with the tube line 6 resting in the groove 6a, whose other end forms the sound inlet opening 7. In the present example, the latter is simply the open end of the tube line.

In a manner not shown in the drawing, there is fastened in the cutout 5a the earphone 5, whose acoustic energy is conducted via the hearing tube 8 into the ear. In the bores 10a of the plate type middle part 1 are received the electrical parts 10 of the amplifier, such as resistors, capacitors, etc. In cutout 12a is lodged the battery 12, and for the volume control 11a shallow depression is provided in the plate type middle part.

As the cover bowls are applied, the seal ribs 13, 14 provided on the cover shells 2, 3 lie on the faces of the plate type middle part directly and keep the sound waves of the earphone 5 away from the microphone 4.

The invention is, of course, not limited to the example of construction illustrated and explained, but can be used in principle for all other models to be worn behind the ear.

#### Claims

1. Hearing aid to be worn behind the ear, consisting of a more or less sickle

854

or crescent-shaped housing which receives the parts of the instrument, such as microphone, amplifier, earphone, battery, etc. and carries in its upper end, lying above the ear when it is worn, a sound inlet opening for the microphone, characterized in that the microphone is arranged in the housing so far away from the sound inlet opening that space present between the microphone and the sound inlet opening is utilized for the accommodation of other parts of the instrument e.g. the earphone and/or the circuit elements of the amplifier, and that the microphone is connected with the sound inlet opening by a tube line serving as sound conduction.

2. Hearing aid according to claim 1, characterized in that the tube line extends completely inside the housing.

3. Hearing aid according to claim 1, characterized in that the tube line extends at least in part on the outside of the housing.

4. Hearing aid according to one of claims 1 to 3, characterized in that the open end of the tube line is directly the sound inlet opening.

5. Hearing aid according to claim 4, characterized in that the open end of the tube line serving as sound inlet opening has a cross-section substantially concurring with the rest of the tube line.

6. Hearing aid according to claim 4, characterized in that the open end of the tube line is enlarged in relation to the rest of the tube line like a funnel or in a similar way.

7. Hearing aid according to claim 4, characterized in that the open end of the tube line is constricted somewhat.

8. Hearing aid according to one or more of claims 1 to 7, characterized in that the direction of the sound inlet opening formed by the open end of the tube line forms, when the instrument is worn behind the ear, an angle of less than  $30^{\circ}$  with the wearer's normal viewing direction.

9. Hearing aid according to one or more of claims 1 to 8, consisting of three modules, namely a plate type middle part, provided with bores and cutouts to receive the parts of the instrument, and two cover shells placed on the two faces of the middle part, characterized in that on one face of the middle part

855

middle part a groove is provided to receive the tube line.

10. Hearing aid according to claims 1 to 3 and 9, characterized in that between the two faces of the plate type middle part, on the one hand, and the inside of the cover shells, on the other, at least one seal separating the earphone from the microphone is provided, which keeps the air-borne sound radiated from the earphone away from the microphone to such an extent that self-excitation or self-buildup of the instrument cannot occur.

11. Hearing aid according to claim 10, characterized in that the seal is formed by ribs molded on the inner side of the cover shells and/or on the plate type middle part.

12. Hearing aid according to claim 10, characterized in that the seal is formed by sound-damping material placed between the plate type middle part and the cover shells.

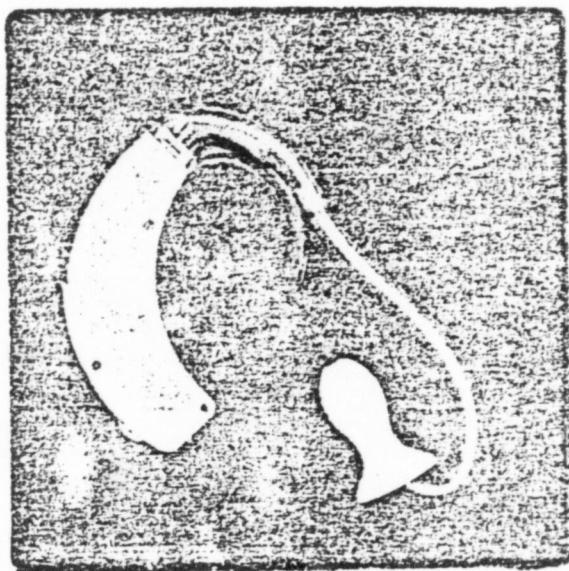
One sheet of drawings annexed

---

Translated by Carl Demrick Associates, Inc./LH/db

856





EP 24/3  
Oticon Hearing Aid

857

# WHAT IS FOCAL SOUND?

FOCAL SOUND is a NEW method of improving sound collection and reception, utilized by OTICON in the newest hearing aid design. The Sound is picked up in the focus of the auricle . . . NOT behind, in front, above or below the ear, but IN the ear.

- EXTRA 10 DB NATURAL GAIN FROM THE AURICLE
- IMPROVED DIRECTIONAL HEARING  
Fitted binaurally gives normal directional hearing ability.
- SIMPLICITY IN FITTING  
Special sound hook in new material is an integral part of the instrument. Needs no adjustment, no cutting. Fits any ear.
- REDUCED WIND NOISE  
Replaceable Windshield and dust filter.

Summaries of a series of investigations into directional hearing carried out with persons with normal hearing in a large anechoic room.

## MONAURAL



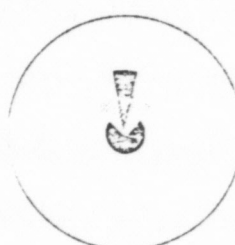
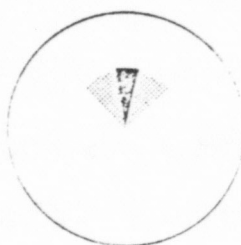
Normal directional hearing ability



Some directional hearing ability



No directional hearing ability

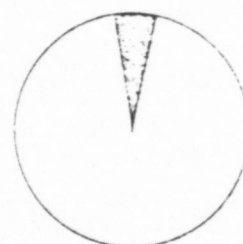
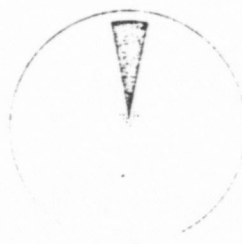
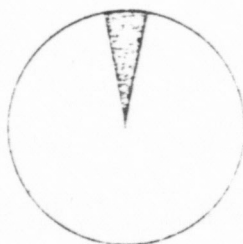


One ear (with no hearing aid): reaction time 10-20 seconds.

One hearing aid of conventional earett type: reaction time 30-60 seconds.

One Oticon 566 Focal Sound: reaction time 10-20 seconds.

## BINAURAL



Two ears (with no hearing aids): reaction time 5 seconds.

Two hearing aids of conventional earett type: reaction time 15 seconds.

Two Oticon 566 Focal Sound: reaction time 5 seconds.

When tested with the Oticon 566 FOCAL SOUND, the reaction time factor compares most favorably with normal hearing, and the results of binaural fitting as regards BOTH reaction time AND directional hearing ability are virtually the same as normal hearing.

Write or phone for further information today!

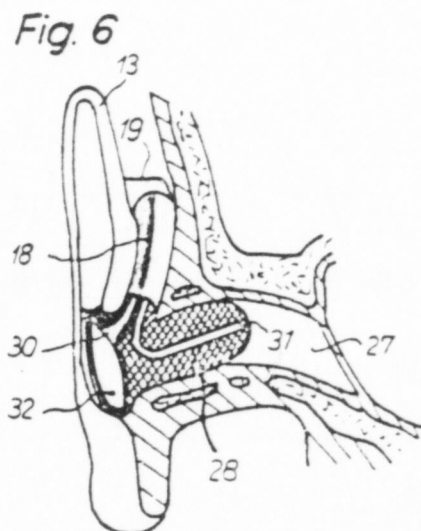
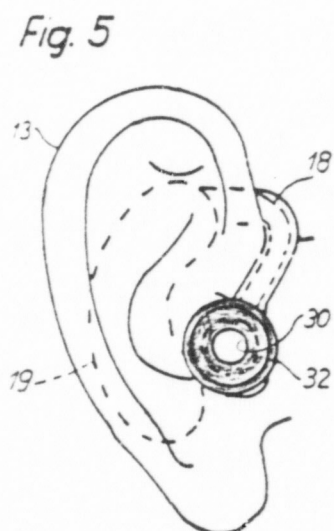
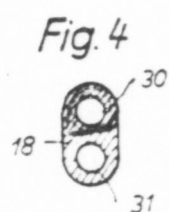
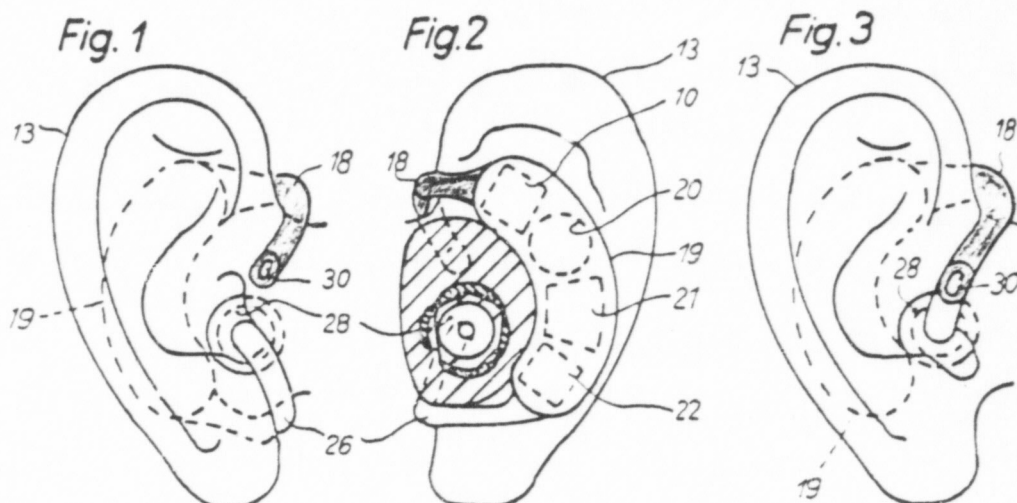


OTICON CORP. 999 STONE ST.  
UNION, N.J. 07083  
PHONE (201) 687-0353

858

HEARING DEALER

Sept. 1968  
4





SCIENTIFIC LIBRARY  
SEP 10 1962  
U. S. PATENT OFFICE

BUNDESREPUBLIK DEUTSCHLAND

KL 21 a<sup>2</sup> 17/03

DEUTSCHES PATENTAMT

INTERNAT. KL. H 04 III



AUSLEGESCHRIFT 1 132 973

M 46916 VIIIa/21a<sup>2</sup>

ANMELDETAG: 22. OKTOBER 1960

BEKANNTMACHUNG  
DER ANMELDUNG  
UND AUSGABE DER  
AUSLEGESCHRIFT: 12. JULI 1962

1

Die Erfindung betrifft eine Weiterbildung des im Hauptpatent 1 078 175 beschriebenen allgemeinen Erfindungsgedankens eines Hörgerätes, bei welchem die dem Mikrophon zuzuführenden Schallwellen auf der Vorderseite der Ohrmuschel aufgenommen und nach elektrischer Verstärkung in einem hinter der Ohrmuschel zu tragenden Gerätegehäuse durch einen Wiedergabe-Hörschlauch einem in den äußeren Gehörgang zu steckenden Ohrpaßstück zugeführt werden.

Die Erfindung besteht darin, daß das in bekannter Weise innerhalb des Gerätegehäuses angeordnete Mikrophon mit einem in der Ohrmuschel etwa am Eingang des äußeren Gehörganges mündenden Schallaufnahmekanal verbunden ist, der vorzugsweise in dem das Gerätegehäuse tragenden, über den oberen Ansatz der Ohrmuschel hinweggreifenden Tragbügel vorgesehen ist. Zur Vermeidung eines besonderen Hörschlauches kann außer dem zum Mikrophon führenden Aufnahme-Hörkanal auch noch ein vom Telefon zum Ohrpaßstück führender Wiedergabe-Hörkanal in dem Tragbügel vorgesehen sein.

Diese neue Gestaltung des Hörgerätes hat den Vorteil, daß die zwischen Mikrophon und Verstärker verlaufenden elektrischen Leitungen innerhalb des Gerätegehäuses liegen und daß trotzdem der Schall hörgerecht in der Außenseite der Ohrmuschel eingebracht wird.

Drei Ausführungsbeispiele der Erfindung sind in der Zeichnung dargestellt. In dieser zeigt

Fig. 1 eine Ansicht der Vorderseite einer Ohrmuschel, an welcher ein Hörgerät mit einem im Tragbügel angeordneten Schallaufnahmekanal und einem von diesem getrennten Wiedergabe-Hörschlauch angebracht ist.

Fig. 2 eine Ansicht der Rückseite der vom Schädel losgetrennten Ohrmuschel mit dem zum Hörgerät nach Fig. 1 gehörenden Gerätegehäuse.

Fig. 3 eine Vorderansicht einer Ohrmuschel mit einem Hörgerät, bei welchem sowohl der Schallaufnahmekanal als auch ein Wiedergabe-Hörkanal in dem Tragbügel für das Gerätegehäuse angeordnet sind.

Fig. 4 einen vergrößerten Querschnitt durch den Tragbügel nach Fig. 3.

Fig. 5 eine Vorderansicht einer Ohrmuschel mit einem der Fig. 3 entsprechenden Hörgerät, bei welchem der Schnellaufnahmekanal in einem Schalltrichter mündet, der am äußeren Ende des mit dem Wiedergabe-Hörkanal verbundenen Ohrpaßstückes angeordnet ist, und

Fig. 6 einen von vorn gesehenen Längsschnitt durch den äußeren Gehörgang und die Ohrmuschel des mit dem Hörgerät nach Fig. 5 versehenen Ohres.

Hinter der Ohrmuschel zu tragendes  
Hörgerät für Schwerhörige

Zusatz zum Patent 1 078 175

Anmelder:

micro-technic Hüber & Co.,  
Stuttgart-Degerloch, Löwenstr. 94

Walter Hüber und Klaus Hüber, Stuttgart-Degerloch,  
sind als Erfinder genannt worden

2

Zu dem Hörgerät gehört ein hinter der Ohrmuschel 13 zu tragendes Gerätegehäuse 19, welches das Mikrophon 10, die Batterie 20, den Verstärker 21 und das Telefon 22 umschließt (Fig. 2). Das Gerätegehäuse 19 wird von einem über den oberen Ansatz der Ohrmuschel hinweggreifenden Bügel 18 getragen, der vorzugsweise aus einem thermoplastischen Kunststoff besteht.

Bei dem in den Fig. 1 und 2 dargestellten Ausführungsbeispiel enthält der Bügel 18 nur einen zum Mikrophon 10 führenden Schallaufnahmekanal 30, dessen äußeres Ende auf der Vorderseite der Ohrmuschel, vorzugsweise vor dem äußeren Gehörgang 27 des Ohres mündet, um an dieser Stelle den zu verstärkenden Schall hörgerecht aufzufangen. Das Telefon 22 ist durch einen besonderen Wiedergabe-Hörschlauch 26 mit einem in den äußeren Gehörgang 27 zu steckenden Ohrpaßstück 28 verbunden.

Bei dem Ausführungsbeispiel nach Fig. 3 ist der Wiedergabe-Hörschlauch 26 nach den Fig. 1 und 2 beseitigt und durch einen in dem Bügel 18 parallel zum Schallaufnahmekanal 30 verlaufenden Wiedergabe-Hörkanal 31 ersetzt, welcher sich in der Bohrung des Ohrpaßstückes 28 bis in den äußeren Gehörgang 27 fortsetzt.

Der Querschnitt des Tragbügels 18 weist somit zwei nur durch eine Zwischenwand voneinander getrennte Kanäle 30 und 31 auf (Fig. 4). Eine akustische Rückkopplung zwischen den beiden Kanälen 30 und 31 findet bei sachgemäßer Ausbildung und Materialwahl für den Tragbügel 18 nicht statt.

209 5 130

860

Das in den Fig. 5 und 6 gezeigte Ausführungsbeispiel unterscheidet sich von dem vorstehend beschriebenen nur dadurch, daß das äußere Ende des Schallaufnahmekanals 30 in einem Schalltrichter 32 mündet, der am äußeren Ende des Ohrpaßstückes 28 angeordnet und mit diesem fest verbunden ist (z. B. aus einem Stück besteht).

# PATENTANSPRÜCHE:

1. Hörgerät für Schwerhörige nach Patent 10 1 078 175, bei welchem die dem Mikrophon zuzuführenden Schallwellen auf der Vorderseite der Ohrmuschel aufgenommen und nach elektrischer Verstärkung in einem hinter der Ohrmuschel zu tragenden Gerätegehäuse durch einen Wiedergabe-Hörschlauch einem in den äußeren Gehörgang zu steckenden Ohrpaßstück zugeführt werden, dadurch gekennzeichnet, daß das in bekannter Weise innerhalb des Gerätegehäuses (19) angeordnete Mikrophon (10) mit einem in der Ohrmuschel etwa am Eingang des äußeren Gehörganges (27) mündenden Schallaufnahmekanal (30) verbunden ist.

2. Hörgerät nach Anspruch 1, dadurch gekennzeichnet, daß der Schallaufnahmekanal (30) in dem das Gerätegehäuse (19) tragenden, über den oberen Ansatz der Ohrmuschel hinweggreifenden Tragbügel (18) vorgesehen ist.

3. Hörgerät nach den Ansprüchen 1 und 2, dadurch gekennzeichnet, daß der Tragbügel (18) außer dem zum Mikrophon (10) führenden Schallaufnahmekanal (30) auch noch einen vom Telefon (22) zum Ohrpaßstück (28) führenden Wiedergabe-Hörkanal (31) enthält.

4. Hörgerät nach Anspruch 3, dadurch gekennzeichnet, daß der Schallaufnahmekanal (30) in einem Schalltrichter (32) endet, der mit dem äußeren Ende des Ohrpaßstückes (28) verbunden ist.

5. Hörgerät nach Anspruch 4, dadurch gekennzeichnet, daß der Schalltrichter (32) mit dem Ohrpaßstück (28) aus einem Stück besteht.

In Betracht gezogene Druckschriften:  
Deutsche Patentschrift Nr. 1 078 175;  
deutsches Gebrauchsmuster Nr. 1 735 662.

Hierzu 1 Blatt Zeichnungen

Federal Republic of Germany

Cl. 21 a<sup>2</sup> 17/03

German Patent Office

Internat. Cl. H 04 m

Provisional Patent (DAS) 1,132,973

M 46916 VI IIa/21 a<sup>2</sup> Filing date: October 22, 1960

Application made public and provisional  
patent issued: July 12, 1962

Hearing aid to be worn behind the ear

Addition to Patent 1,078,175

Applicant:

micro-technic Hüber & Co.,  
Stuttgart-Degerloch, Löwenstr. 94

Walter Hüber and Klaus Hüber, Stuttgart-Degerloch, have been named as inventors

The invention concerns a further development of the general conception of a hearing aid described in the main patent 1,078,175, where the sound waves to be supplied to the microphone are received on the front of the auricle and after electric amplification in a housing to be worn behind the auricle are fed through a reproduction hearing tube to an ear-piece to be inserted into the outer aural passage.

The invention consists in that the microphone, arranged in known manner inside the housing, is connected with a sound receiving canal which terminates in the auricle approximately at the entrance of the outer aural passage and which is preferably provided in the supporting yoke carrying the housing and engaging over the upper attachment of the auricle. To avoid a special hearing tube, there may be provided, besides the reception hearing canal leading to the microphone, a reproduction hearing canal in the supporting yoke leading from the telephone to the ear-piece.

862



This new design of the hearing aid has the advantage that the electric lines extending between microphone and amplifier lie within the housing and that nevertheless the sound is caught on the outer side of the auricle as in natural hearing.

Three embodiments of the invention are illustrated in the drawing. In it -  
Fig. 1 shows a view of the front of an auricle to which is fitted a hearing aid with a sound receiving canal in the supporting yoke and with a reproduction hearing tube separated therefrom;

Fig. 2, a view of the back of the auricle separated from the skull, with the housing belonging to the hearing aid according to Fig. 1;

Fig. 3, a front view of an auricle with a hearing aid where the sound receiving canal as well as the reproduction hearing canal are arranged in the supporting yoke for the housing;

Fig. 4, an enlarged transverse section through the supporting yoke according to Fig. 3;

Fig. 5, a front view of an auricle with a hearing aid corresponding to Fig. 3, where the sound receiving canal opens into a sound funnel arranged on the outer end of the ear-piece connected with the reproduction hearing canal; and

Fig. 6, a longitudinal section, seen from the front, through the outer aural passage and the auricle of an ear fitted with the hearing aid according to Fig. 5.

There belongs to the hearing aid an instrument housing 19 to be worn behind the auricle 13 and enclosing the microphone 10, battery 20, amplifier 21, and telephone 22 (fig. 2). The housing 19 is carried by a yoke 18 engaging over the upper attachment of the auricle and preferably consisting of a thermoplastic material.

In the embodiment illustrated in Fig. 1 and 2, yoke 18 contains only one sound receiving canal 30, which leads to the microphone 10, and whose outer end terminates on the front of the auricle, preferably before the outer aural passage 27 of the ear, in order to catch at this point the sound to be amplified, as in

863

natural hearing. The telephone 22 is connected by a special reproduction hearing tube 26 with an ear-piece 28 to be inserted into the outer aural passage 27.

In the embodiment according to Fig. 3, the reproduction hearing tube 26 according to Fig. 1 and 2 has been removed and replaced by a reproduction hearing canal 31 extending parallel to the sound receiving canal 30 in yoke 18 and prolonged in the bore of the ear-piece 28 up into the outer aural passage 27.

The cross-section of yoke 18 thus has two canals 30 and 31 separated from each other only by a partition (fig. 4). With proper design and material selection for the yoke 18, acoustic feedback does not take place between the two channels 30 and 31.

The embodiment shown in Fig. 5 and 6 differs from the one described above only in that the outer end of the sound receiving canal 30 opens in a sound funnel 32 which is arranged on the outer end of the ear-piece 28 and is firmly connected therewith (e.g. is made of one piece).

#### Claims

1. Hearing aid for the hard-of-hearing according to Patent 1,078,175, where the sound waves to be fed to the microphone are received on the front of the auricle and after electric amplification in a housing to be worn behind the auricle are fed through a reproduction hearing tube to an ear-piece to be inserted in the outer aural passage, characterized in that the microphone (10) arranged in known manner inside the housing (19) is connected with a sound receiving canal (30) terminating in the auricle approximately at the entrance of the outer aural passage (27).

2. Hearing aid according to claim 1, characterized in that the sound receiving canal (30) is provided in the supporting yoke (18) carrying the housing (19) and engaging over the upper attachment of the auricle.

3. Hearing aid according to claims 1 and 2, characterized in that the supporting yoke (18) contains, besides the sound receiving canal (30) leading to the

(864)

microphone (10), a reproduction hearing canal (31) leading from the telephone (22) to the ear-piece (28);

4. Hearing aid according to claim 3, characterized in that the sound receiving canal (30) ends in a sound funnel (32) which is connected with the outer end of the ear-piece (28).

5. Hearing aid according to claim 4, characterized in that the sound funnel (32) is of one piece with the ear-piece (28).

Publications taken into account: German Patent No. 1,078,175; German Utility Model No. 1,735,662.

---

Translated by Carl Demrick Associates, Inc./LH/db

865



April 22, 1969

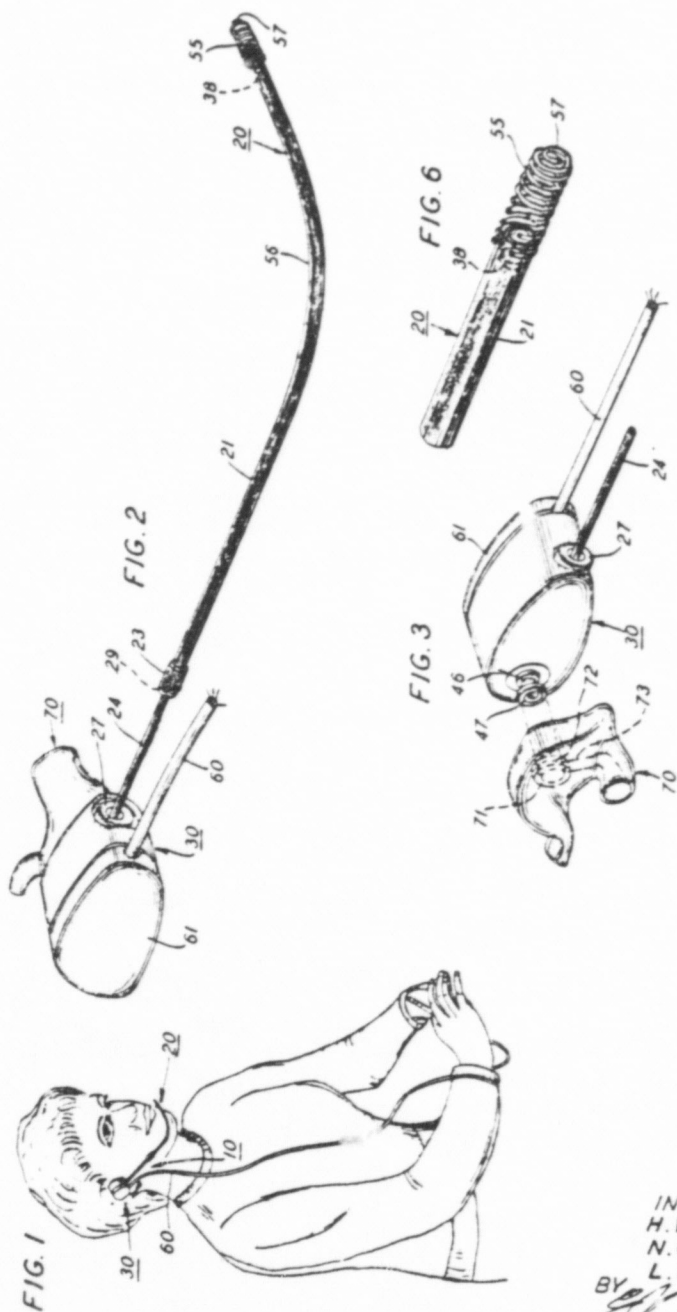
H. W. BRYANT ET AL

3,440,365

TELEPHONE HEADSET WITH ADJUSTABLE SPEECH TUBE

Filed Nov. 4, 1965

Sheet 1 of 2



INVENTORS  
H. W. BRYANT  
N. C. HAZELL  
L. W. MOSING  
BY *E. J. Lindner*  
ATTORNEY

866

April 22, 1969

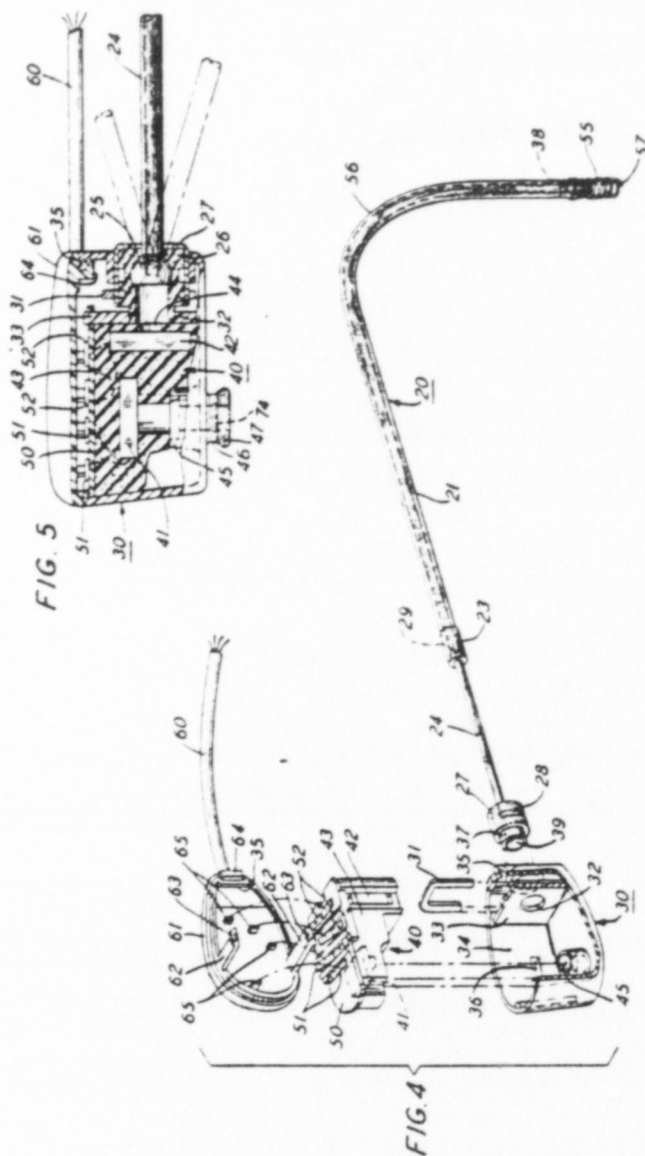
H. W. BRYANT ET AL.

3,440,365

TELEPHONE HEADSET WITH ADJUSTABLE SPEECH TUBE

Filed Nov. 4, 1963

Sheet 2 of 2



1

3,440,365

TELEPHONE HEADSET WITH ADJUSTABLE  
SPEECH TUBE

Herbert W. Bryant, Middletown, Norman C. Hazell, Free-  
hold, and Lionel W. Mosing, Springfield, N.J., assignors  
to Bell Telephone Laboratories, Incorporated, New  
York, N.Y., a corporation of New York

Filed Nov. 4, 1965, Ser. No. 506,310

Int. Cl. H04m 1/05

U.S. Cl. 179-156

6 Claims

2

## ABSTRACT OF THE DISCLOSURE

A telephone headset is disclosed consisting of a hous-  
ing, containing the transmitter and receiver, a two-piece  
speech tube connected to the housing, and an acoustic ear  
insert on which the housing is mounted. The housing can  
rotate on the ear insert, the fitting permitting this also  
constituting a part of the acoustic passage between the  
inner ear and the receiver. The inner portion of the speech  
tube is rigid and swivelably mounted to the housing. The  
outer piece is curved and also slidable and turnable with  
respect to the inner portion. The geometry allows adjust-  
ment of the headset to almost any wearer's head con-  
figuration.

This invention relates to transmitter-receiver units of  
the type supported during use upon the head of the user,  
and, in particular, to headsets worn by telephone opera-  
tors.

An increasing concern for operator comfort as well as  
equipment performance has prompted much recent effort  
to improve radio and telephone headsets. Broadly, the  
two prime causes of wearer discomfort are the weight  
and bulk of the set, and the distribution of whatever  
weight is involved. Significant weight and size reductions  
are achieved by replacing the heavy magnetic core re-  
ceivers and carbon-type transmitters with miniature  
balanced armature transducers of the type routinely used  
in hearing aid devices. These transducers operate advan-  
tageously in conjunction with acoustic pick-up tubes, and  
this expedient has also been employed in the telephone  
headset art to reduce weight.

However, several facets of the weight distribution  
problem have not been solved satisfactorily. Moreover,  
other important and persistent problems, including pick-  
up tube positioning limitations and the manner of support  
for the whole headset, require better solutions, preferably  
ones which in fact further reduce the weight distribution  
problem instead of complicating it.

One of the problems relates to headbands per se,  
which are necessary with most headset designs to provide  
the needed support. Headbands are inherently bulky, add  
to the headset's cost, and must be maintained and stored.  
For some applications as, for example, when other heavy  
headgear must also be worn, headbands are frequently  
inconvenient or unsuitable. Moreover, to a large number  
of hairdress-conscious women operators, headbands of  
any type are anathema because of their bulk and tendency  
to snag and disturb the hair. One typical substitute for  
the headband is a supportive lanyard, but these lend only  
loose support and consequently the set is not held stably  
in the required position. Other methods of avoiding head-  
band support include suspending the set from a loop

placed around the ear, similar to eyeglass frames, or  
suspending the set from the eyeglass frame itself. The  
eyeglass clip method, however, tends to shift the optical  
axis, and is limited in any case to persons who wear  
glasses. The over-ear loop lacks stability and also disturbs  
the optical axis if glasses are also worn.

Another general problem involves the support or sus-  
pension mechanisms for positioning the headset in ac-  
cordance with the wearer's mouth-ear geometry. One  
aspect is that conventional supports incorporated in head-  
set designs in an effort to make the set adaptable to widely  
varying head geometry or wearing preferences, employ  
very complicated and bulky adjustment features. Simplified  
support designs have sacrificed at least to some extent  
the adjustability. Further, earlier support designs do not  
take into account adequately certain wearer preferences,  
particularly of telephone operators, which include loca-  
tion of the supportive pressure, manner of putting on and  
removing the set and movement of the transmitter in-  
dependently of the receiver.

A related problem is that the position, in which opera-  
tors are willing, or tend, to wear a given headset do not  
coincide necessarily with the position in which the set  
performs best. To treat this problem and the preceding  
ones simultaneously, requires acoustic refinements not  
found in prior art devices.

A further problem, principally one of acoustics but  
bearing importantly on operator comfort, relates to the  
receiver-to-ear seal. Tight seals are desirable from the  
transmission standpoint, but are achieved in today's head-  
sets with considerable sacrifice in operator comfort.

Another drawback of headsets using acoustic pick-up  
tubes relates to the effects created under certain circum-  
stances by operator speech sounds such as *b* and *p*. The  
operator's breath which produces these sounds is a strong  
puff that impinges full-force upon the tube entrance nor-  
mally maintained about three-fourths of an inch in front  
of the mouth. The sidetone this creates is audible to oper-  
ator and calling party; and at high levels is unpleasant  
and distracting to both. The effect is minimal if, as with  
sets having conventional size earcups, there are sufficient  
sound leakage losses inherently present in the set. How-  
ever, the problem becomes acute if a receiver of high  
efficiency is employed. In such case the sidetone effects of  
*b* and *p* sounds compel the operator to place the tube  
entrance farther from the mouth or to use a reduced  
speech level. Either action weakens the transmission level  
and makes reception of operator speech by the calling  
party difficult.

Accordingly, a general object of the invention is to re-  
duce substantially the degree of discomfort incident to  
wearing a telephone headset.

Another object of the invention is to improve the  
acoustic performance of telephone headsets.

A further object of the invention is to simplify the  
positionability of the several elements in a typical opera-  
tor's headset.

A further object of the invention is to reduce the abso-  
lute number of elements necessary in a headset.

A still further object of the invention is to eliminate  
the unpleasant sidetone effects caused by puff sounds in a  
headset using an acoustic pick-up tube.

These and other objects are accomplished in accord-  
ance with the invention in a telephone headset in which  
a single, compact housing, containing the transducers

868



and all connections and supporting a widely adjustable acoustic pick-up tube, is suspended from an acoustic earpiece inserted in the operator's ear.

In one embodiment of the invention, the housing is rotatably mounted on the earpiece. The speech tube is mounted in a ball-joint within the housing to permit adjustments in a large circular arc. Further rotative and longitudinal adjustments are achieved with a slide feature. The headset cord connector is integral with the cap to the housing, which reduces bulk and weight and facilitates cord replacement. The housing, speech tube and cord are thus placed well out of the operator's line of vision and away from her work area.

Advantageously, the plastic ear insert is molded to fit the particular ear geometry of the user. This expedient, well known in the hearing headset art, achieves not only the expected superior receiver-to-ear seal, but because of its snug fit provides a point of suspension for the headset proper that is secure, stable and surprisingly comfortable.

In accordance with another aspect of the invention, a puff screen is mounted at the entrance to the acoustic pick-up tube to reduce the sidetone effects caused principally by the sounds of *b* and *p*. The screen is an extended coil spring with inwardly-extending helical end portion and, advantageously, a plastic coating. The acoustic energy of the *b* and *p* sounds is dissipated by a turbulence produced when the waves impinge on the spring, which allows only a small fraction of these waves to pass at their original velocity.

Accordingly, a feature of the invention relates to suspending and acoustically coupling an operator's headset from an acoustic ear insert.

A further feature of the invention lies in employing a custom-molded plastic acoustic ear insert as a support for an operator's headset, on which the latter may be rotatably positioned.

A still further feature of the invention resides in a combination of added adjustments enabling the pick-up tube to be positioned and retained at any selected position adjacent the operator's mouth without impairing the acoustic couplings.

A still further feature of the invention involves a spring-like puff screen that alleviates the distortive effects of sounds such as *b* and *p*.

Other objects and features of the invention will be readily discernible in the description to follow of an illustrative embodiment thereof and in the drawing in which:

FIG. 1 shows a headset in place upon an operator,

FIG. 2 is a perspective of the headset;

FIG. 3 is a perspective showing the ear insert and the mounting coupling;

FIG. 4 is a perspective in expanded form showing the elements of the headset;

FIG. 5 is a perspective view in partial cutaway of the housing and acoustic tube mounting; and

FIG. 6 is a side perspective of a distortion reducing screen.

FIG. 1 shows a headset embodying the inventive concepts in place on an operator and designated generally as 10. Essentially, headset 10 comprises acoustic pick-up tube 20 and housing 30. A cord 60 attaches to housing 30. Pursuant to a fundamental aspect of the invention, headset 10 is suspended completely from an acoustic ear insert or earpiece 70, shown in FIG. 3 and described in detail later. This manner of suspension eliminates need for head straps or other supportive structure.

As shown in FIGS. 2 and 4, pick-up tube 20 comprises a plastic tube 21 at the end adjacent the operator's mouth and a rigid tube 24 at the other end. Tube 21 may be made with cellulose acetate and advantageously includes a straight section followed by a curved section 56 near the wearer's mouth. Tube 24 is preferably of stainless steel and includes an acoustic ball-joint 25 at one end. Ball-joint 25 is made advantageously of stainless steel or

a suitable lightweight material and, as in FIG. 5, provides a mounting for tube 21. Ball-joint 25 joins the housing in a slight interference in a resilient fitting 26 of neoprene or an equivalent, which serves as a frictional mounting socket. The fitting 26 is enclosed in a retainer 27 that seats in housing 30, and that includes a longitudinal acoustic passage 39. Tube 20 may be swivelled within the socket through a considerable circular arc, e.g., 15 degrees. A wide range of adjustments of the end of speech tube 21 with respect to the operator's mouth is thus possible, even without changing the position of housing 30 on earpiece 70.

Pursuant to the invention, tube 24 telescopes and rotates within the straight portion of tube 21 in a light friction fit therewith. A metal ferrule 23 is crimped to plastic tube 21 in order to retain an acoustic and mechanical sealing washer 29 around tube 21, in a substantial friction fit. The curved section 56 together with the ball-joint feature allows for jowl clearance for tube 21 so that the open end thereof can always be positioned next to the wearer's mouth. The longitudinal and rotational adjustment in conjunction with curved section 56 allows a full range of positions to accommodate any ear-to-mouth geometry for either male or female wearers. Tube 21 may be removed for replacement easily by a light pulling, but will retain stably any position of adjustment in which it is placed. Advantageously, tube 21 may be transparent so that any dust or foreign matter accumulation can be spotted and removed.

Pursuant to one aspect of the invention, a screen 55 covers the open end of plastic tube 21 to overcome sidetone effects caused particularly by *b* and *p* speech sounds. As shown in FIG. 2 and again in FIG. 6 in greater detail screen 55 is an elongated coil with a coned-in helical end 57. Spring 22 is made advantageously, of steel music wire coated with a hard smooth plastic. The adjacent coils are closely spaced and the end helix spirals into a center point. Spring 55 serves to reduce the puff distortions by causing a turbulence in the speech air stream which helps reduce its forward velocity and dissipates some of its energy. The puff sounds are further reduced by a sintered disc 38 at the end of the tube by means of dissipation.

While the described puff screen may, of course, be employed to advantage on any acoustic pick-up tube, it is especially valuable to the instant invention because it helps make practicable the suspending of the headset from an acoustic ear insert. The tight acoustic seal between insert and ear transmits sound essentially without loss, so that without the screen the acoustic blasts to the ear resulting from the puffs would be severe.

As seen in FIG. 4, a disc of porous material 38 such as sintered stainless steel is situated in tube 21 inwardly of screen 55, to damp resonant peaks resulting from standing waves. Retainer 27 is attached and acoustically sealed to housing 30 by a clip 31 that fits through a pair of opposed slots 28 in the sides of the retainer. A flange 37 on fitting 26 snugly seats to an aperture 32 of partition wall 33 within housing 30. To the other side of wall 33 is a recess 34 into which transducer mounting unit 40 fits.

Unit 40 consists of a receiver-transducer 41 and transmitter-transducer 42, advantageously mounted at right angles to each other and individually surrounded by a form-fitting cushion of rubber-like material 43. Transducers 41 and 42 are of the miniature balanced armature variable reluctance type. This transducer can be obtained either as a receiver or as a microphone. The receiver, with the proper type coupling, can develop sound pressures in the ear that can be significantly higher than those produced by conventional receivers for the same electrical input. In the form of a microphone used in conjunction with an amplifier as, for example, that described in W. J. Brown patent application Ser. No. 455,714, filed May 14, 1965, and assigned to applicant's as-

869

signee, the transducer can deliver to the telephone line electrical power higher than that of the headset carbon microphone widely used in the industry. The impedance of transmitter 42 is a few thousand ohms at 1000 c.p.s.; that of receiver 41 is a few hundred ohms at 1000 c.p.s.

Apertures 44 are provided in the cushion 43 at two points. One point coincides with the acoustic aperture 32 that passes acoustic waves through housing 30 from tubes 21 and 24. The second lines up with an acoustic aperture 45 in housing 30, as shown in FIG. 4, that connects to earpiece 70. Aperture 45 occurs throughout the length of an acoustic fitting 46 that is mounted on housing 30 opposite the terminus of cord 60, and to which in accordance with the invention the supportive earpiece is fastened.

Unit 40 and terminal block 50 comprise in effect a single module that requires only manual insertion and not leads, that facilitates manufacture and that allows easy field replacement of transducers if necessary, from an on-hand supply. By this construction, enough room is saved in housing 30 to include other devices therein as, for example, a clock-suppressing varistor if desired.

A top transducer mounting unit 40 is a terminal block 50 that includes a first and a second pair of spring connectors 51 and 52, advantageously having a high palladium content. Spring connectors 51, 52 have sufficient tension to accommodate the various fits between the housing and the end cap. Block 50 is formed of a stiff, glass fiber-filled nylon resin. Electrical connections (not shown) are effected between connector pair 51 and receiver-transducer 41, and also between connector pair 52 and transmitter-transducer 42.

An end cap or cover 61 is molded directly onto the end of cord 60. A plurality of contacts—in this instance, four—are connected to the conductors of cord 60 and also molded directly into cap 61. Each contact 65 lines up with and touches a separate one of the spring contacts of connectors 51 and 52. Pursuant to an important aspect of the invention, molding of cap 61 directly to cord 60 eliminates need for a stayband, which reduces weight and saves space. Cap 61 has a locking tab 64 which catches beneath a lip 35 in housing 30. A pair of legs 62 each with an outwardly-extending end nub 63 are molded integrally with cord 60. Legs 62 fit into recess 34 and the nubs 63 lock into corresponding grooves 36 in the sides of housing 30 to effect the final closure generally of cap 61 upon housing 30. Cap 61 fits onto housing 30 so that cord 60 is parallel to tube 24. This makes it possible to wear the set comfortably upon either ear.

In accordance with a prime aspect of the invention, as shown in FIG. 3, support for the headset 10 is given by acoustic earpiece or ear insert 70. Earpiece 70 is custom-molded to fit the outer ear cavities of the wearer and includes an acoustic passage 73 between the innermost end and its outer coupling 71. An annular groove 72 around the inner diameter of coupling 71 allows earpiece 70 to be snapped on over a lip 47 on fitting 46 in a light interference fit. When so attached, housing 30 is rotatably adjustable with respect to earpiece 70. A disc of porous sintered steel 74 is lodged inwardly of lip 47 to suitably damp the response peaks of the acoustic system of the receiver. Separate plug inserts must be molded for left and right ears. In practice, each wearer is responsible for his or her own inserts, including storage and occasional cleaning.

Another important advantage of supporting the headset from an ear insert is that there is little or no low overhanging mass involved, to distract or disturb the operator. Also, since the entire headset is held essentially to the ear, no discernible movement of inertia can be produced by turning of the head. Moreover, what little torque is applied to the insert by the movement of the headset and speech tube is in the direction of the outer ear helix which serves to secure it further. Additionally, the unob-

trusiveness of the set resulting from its lightness and close fit to face, contributes much to its acceptance by telephone operators and consequently to better operator service.

The operation of headset 10 is simple, involving simply snapping together of housing 30 and of insert 70, and then placing of insert 70 into position in the ear and finally adjusting the speech tube to position the puff screen 55 with respect to the wearer's mouth in accordance with the various above-described inventive adjustments. As the entire headset, including a portion of the cord need weigh only about 18 grams, it is unnecessary to support it any way other than that described. However, some operators prefer to support some of the weight of cord 60 with a neck lanyard (not shown) worn in necklace fashion that fastens to cord 60 about two feet away from housing 30. The acoustic leakage losses to the outside are extraordinarily low, due, in accordance with the invention, to the compact tight construction throughout. With the puff screen located about three-fourths of an inch from the user's mouth, a high level of performance will occur regardless of the specific adjustment fit employed.

While several embodiments of the inventive concept have been shown and described, it is to be expressly understood that further changes and modifications may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. A telephone headset comprising: a transmitter, a receiver, and means for housing said transmitter and receiver; an acoustic ear insert comprising a rigid plug-like body with an outer surface, an outer ear helix, an ear canal extension and an acoustic through-passageway running from said outer surface and including said extension; means for supporting said housing means upon said ear insert outer surface for rotation about an axis which when the insert is being worn is substantially normal to the side of the wearer's head; and means including said support means for acoustically connecting said through-passageway and said receiver.

2. A telephone headset in accordance with claim 1 further comprising an acoustic tube having a rigid inner portion with a ball-joint at one end thereof and a curved outer portion slidably and rotatably mounted upon said rigid portion, and means including compliant material mounted adjacent said transmitter for frictionally and swivelably mounting said ball-joint in said housing, whereby said acoustic tube outer portion is selectively positionable with respect to the wearer's mouth without disturbing said headset housing and said ear insert.

3. A headset in accordance with claim 1 further comprising a rigid straight inner acoustic tube, means swivelably retaining an end of said inner tube within said housing, means acoustically connecting said inner tube and said transmitter, a compliant outer acoustic tube, means including a straight portion of said outer tube for slidably and rotatably mounting same upon said inner tube in a slight interference fit, and means including a curved end portion of said inner and outer tubes for effecting an adjustable clearance between said inner and outer tubes and the user's jaw, whereby the entrance of said outer tube is positioned next to the user's mouth regardless of head shape.

4. A headset in accordance with claim 3 wherein said outer acoustic tube further comprises means, including an elongated open wound steel spring axially aligned with and fixedly mounted on said tube end and having an inwardly-directed helical outer end, responsive to high-energy bursts of acoustic signals impinging thereon for creating an air turbulence thereby to dissipate said energy and reduce detone effects of said bursts.

5. A headset in accordance with claim 1 wherein said housing means further comprises a container portion for supporting said transmitter and said receiver, a contact board including a plurality of contact springs, a plurality



of electrical connections between said contact springs and said transmitter and receiver means, and a cap portion comprising a plurality of electrical contacts for effecting contact with respective ones of said contact springs.

6. A telephone headset in accordance with claim 1, wherein said housing support means comprises a lipped fitting, and said acoustic passage at said ear insert outer surface includes a corresponding annular groove to accommodate said lipped fitting in a light interference fit, thereby to enable said ear insert to be snapped on and off of said housing.

## References Cited

## UNITED STATES PATENTS

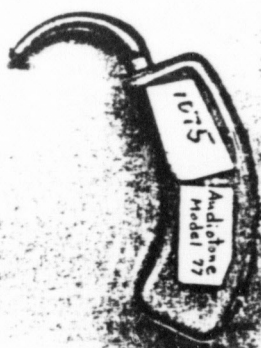
2,904,640	9/1959	Dreher et al. ....	179—156
2,566,313	9/1951	Cates .....	181—22
3,184,556	5/1965	Larkin .....	179—156
3,280,273	10/1966	Flygstad et al. ....	179—156

WILLIAM C. COOPER, *Primary Examiner*.

871



K-2



EX. K-2

822

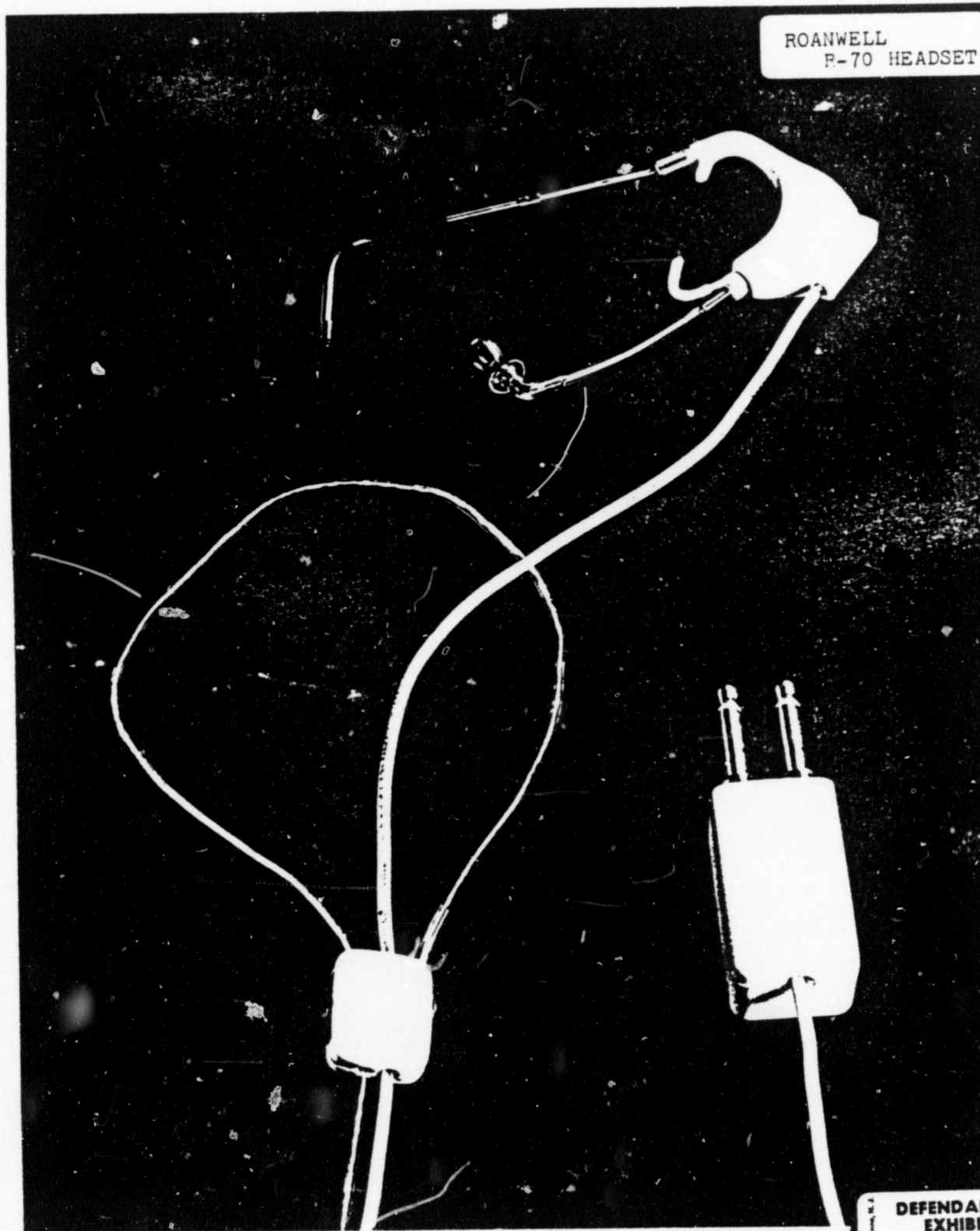
ROANWELL  
R-70 HEADSET



873

DEFENDANT'S  
EXHIBIT  
NO. L-1

ROANWELL  
P-70 HEADSET

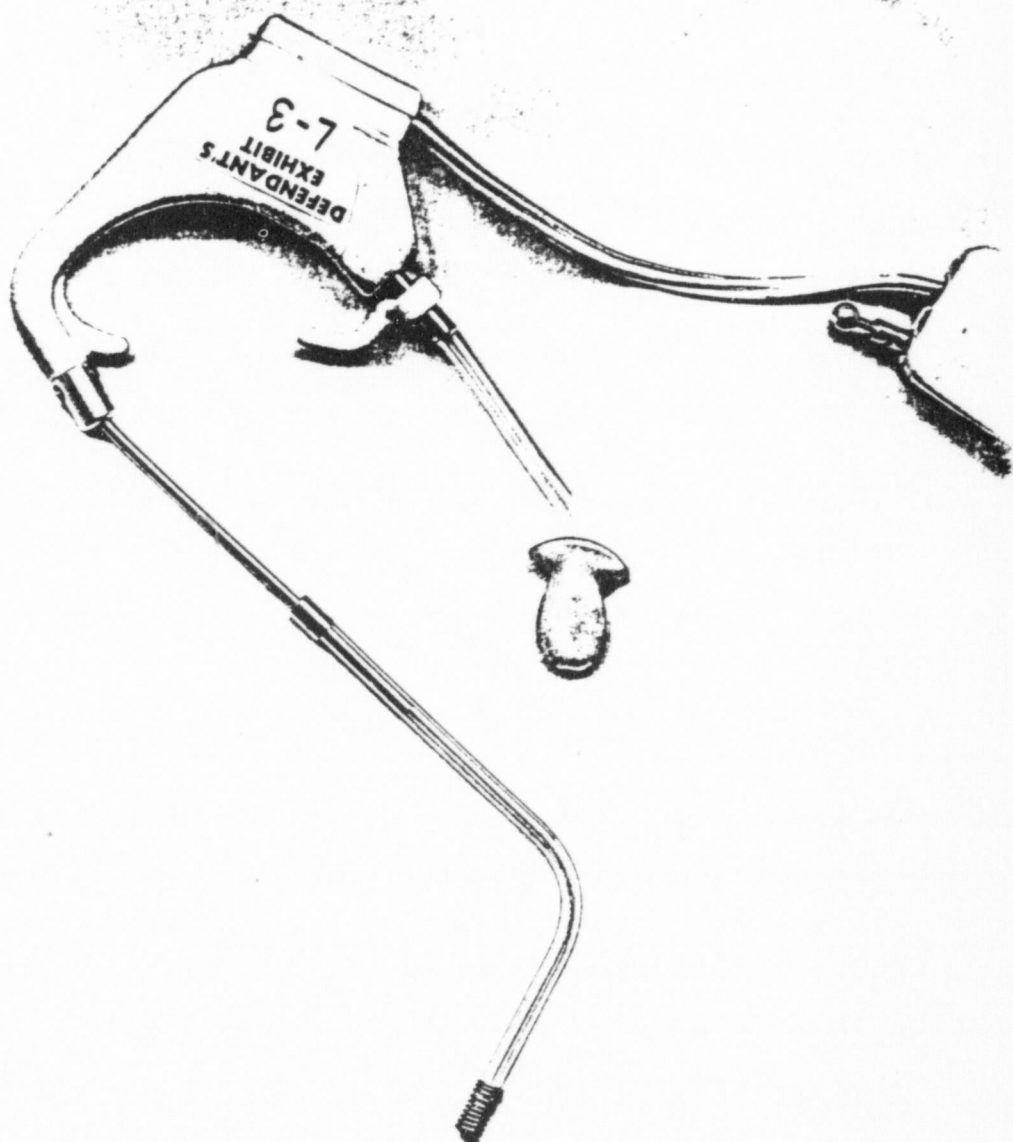


DEFENDANT'S  
EXHIBIT

L-2

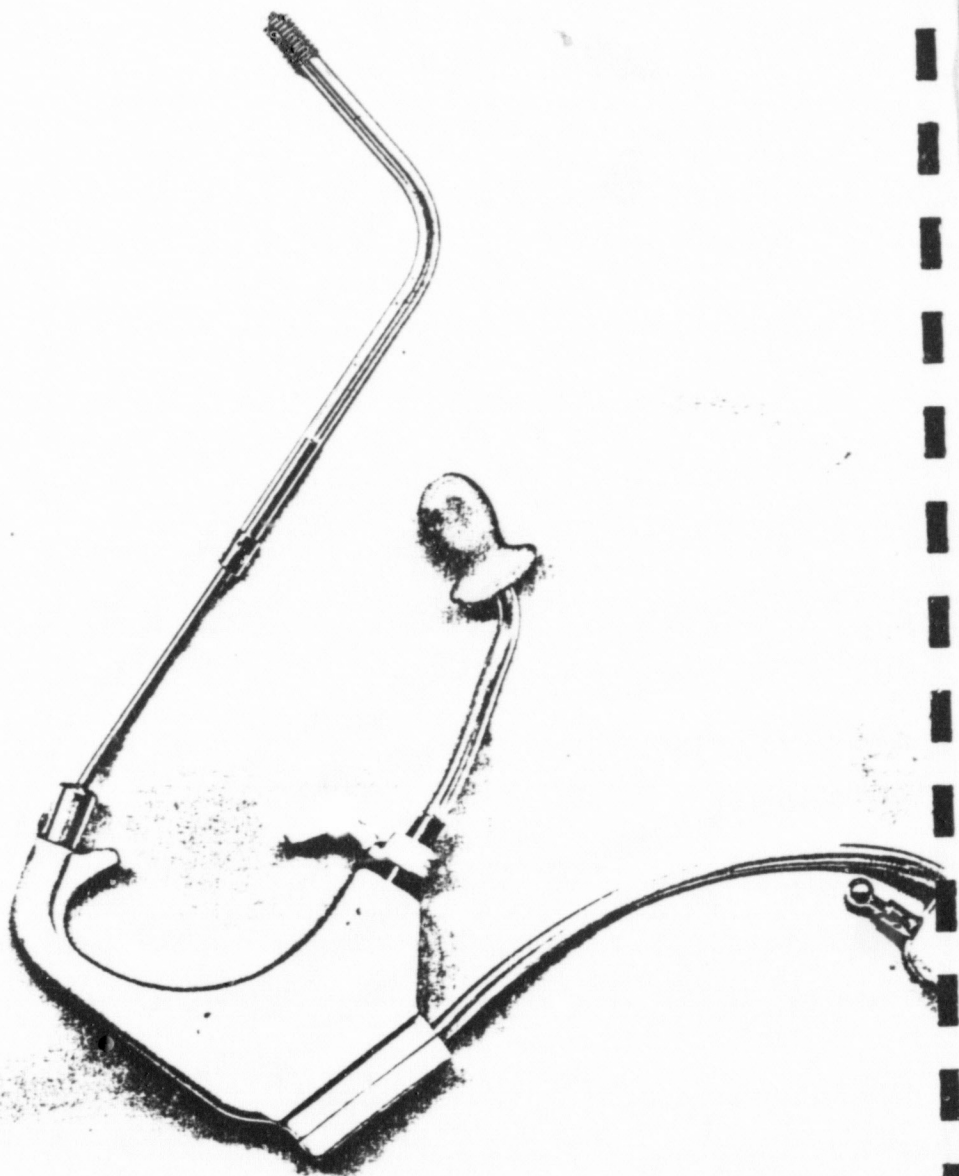
874





EX. L-3

875



Ex. L-3

876

ROANWELL  
R-71 HEADSET

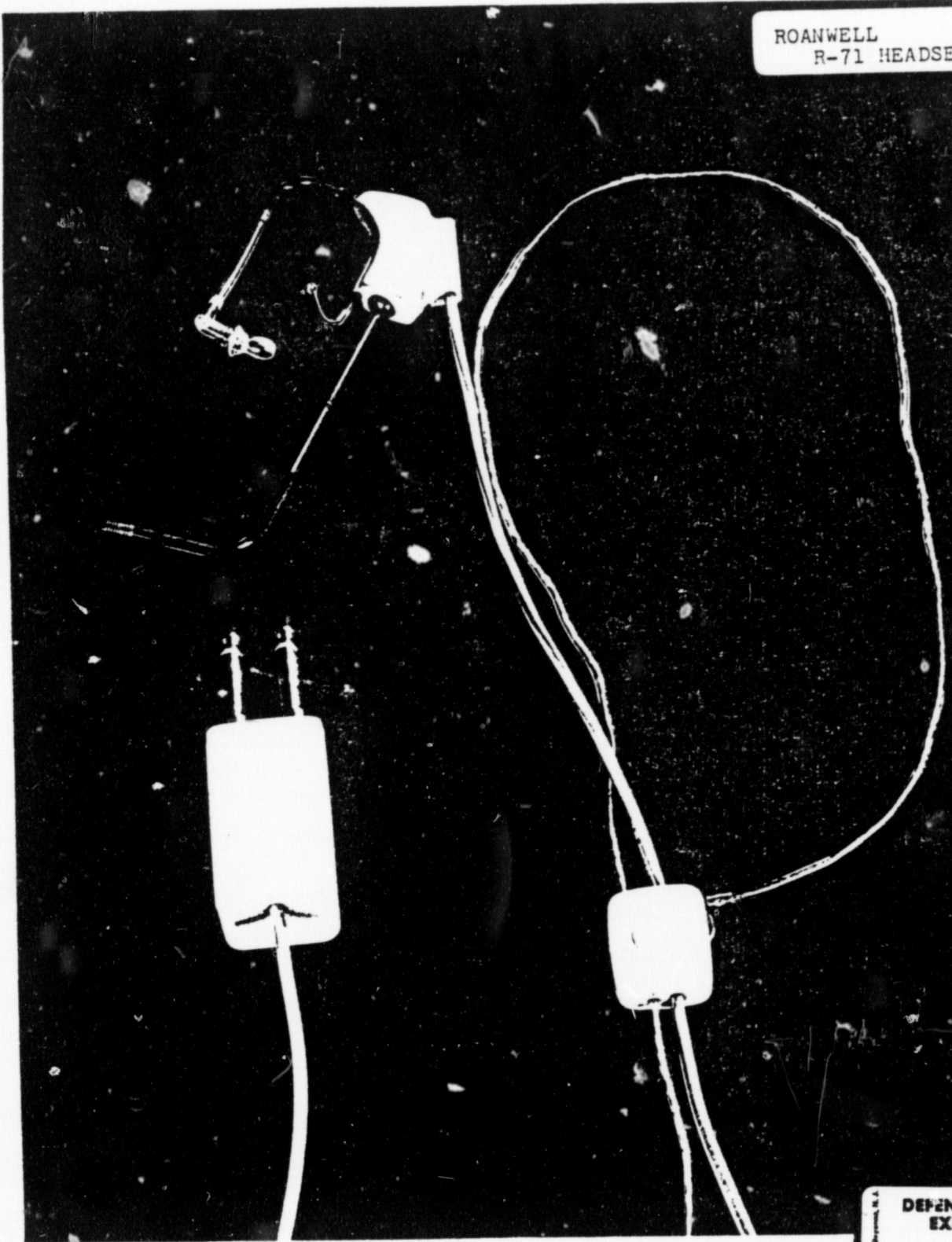


877

DEFENDANT'S  
EXHIBIT  
NO. M-1

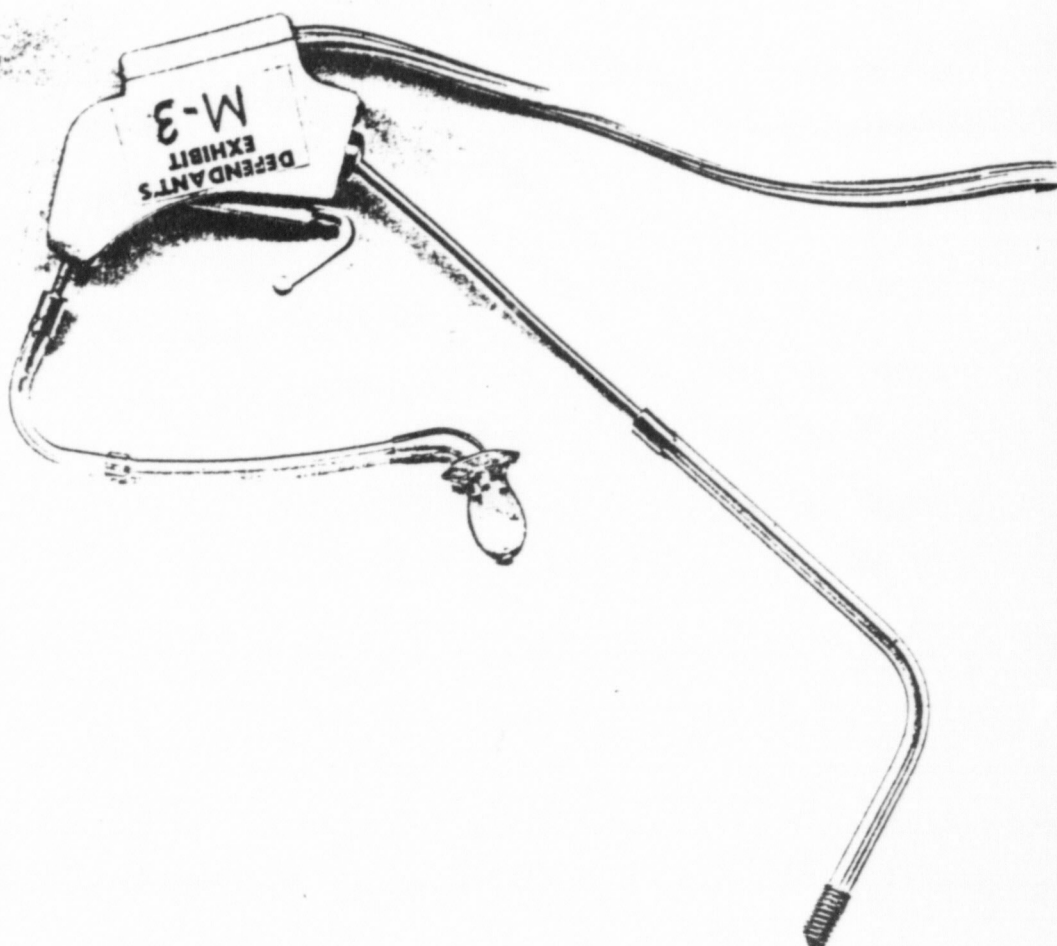


ROANWELL  
R-71 HEADSET



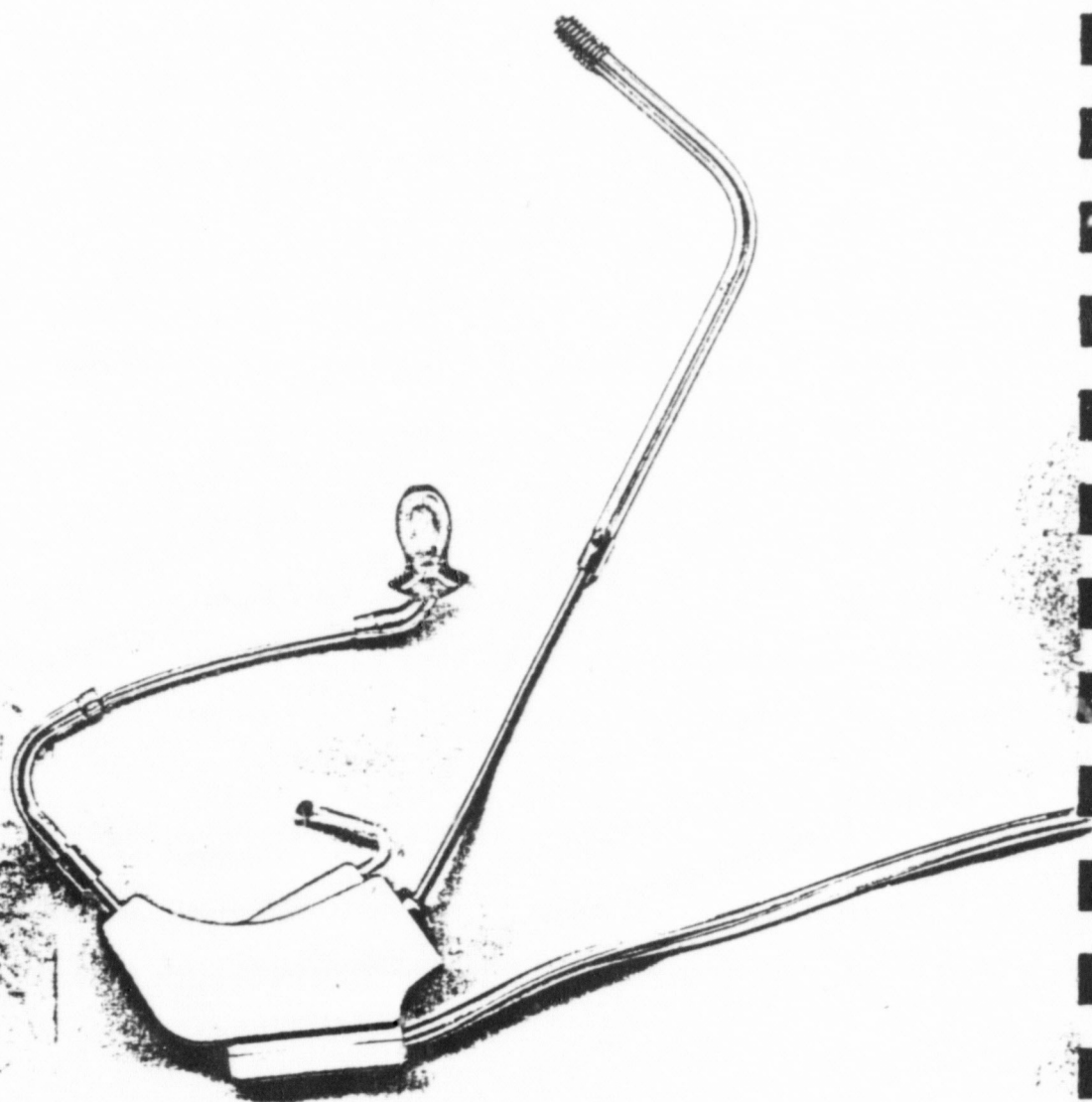
DEFENDANT'S  
EXHIBIT  
M-2  
NO.

878



EX. M-3

879



Ex. M-3

880





ROANWELL  
CORPORATION

## MODEL R-70A LIGHTWEIGHT TELEPHONE OPERATORS' HEADSET

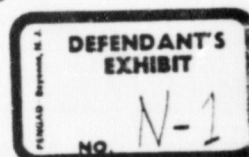
Transducers Meet Telephone Industry Standards of Quality  
Behind-the-Ear Design Offers Comfort and Lightness

Model R-70A behind-the-ear telephone operators' headset, designed and manufactured by Roanwell, has wide applications including PBX and other console operations.

The transducers employed in the R-70A are characterized by high resistance to shock, low distortion and lightweight. The adherence of the R-70A transducers to telephone quality standards distinguishes this model from competitive headsets of a similar design.

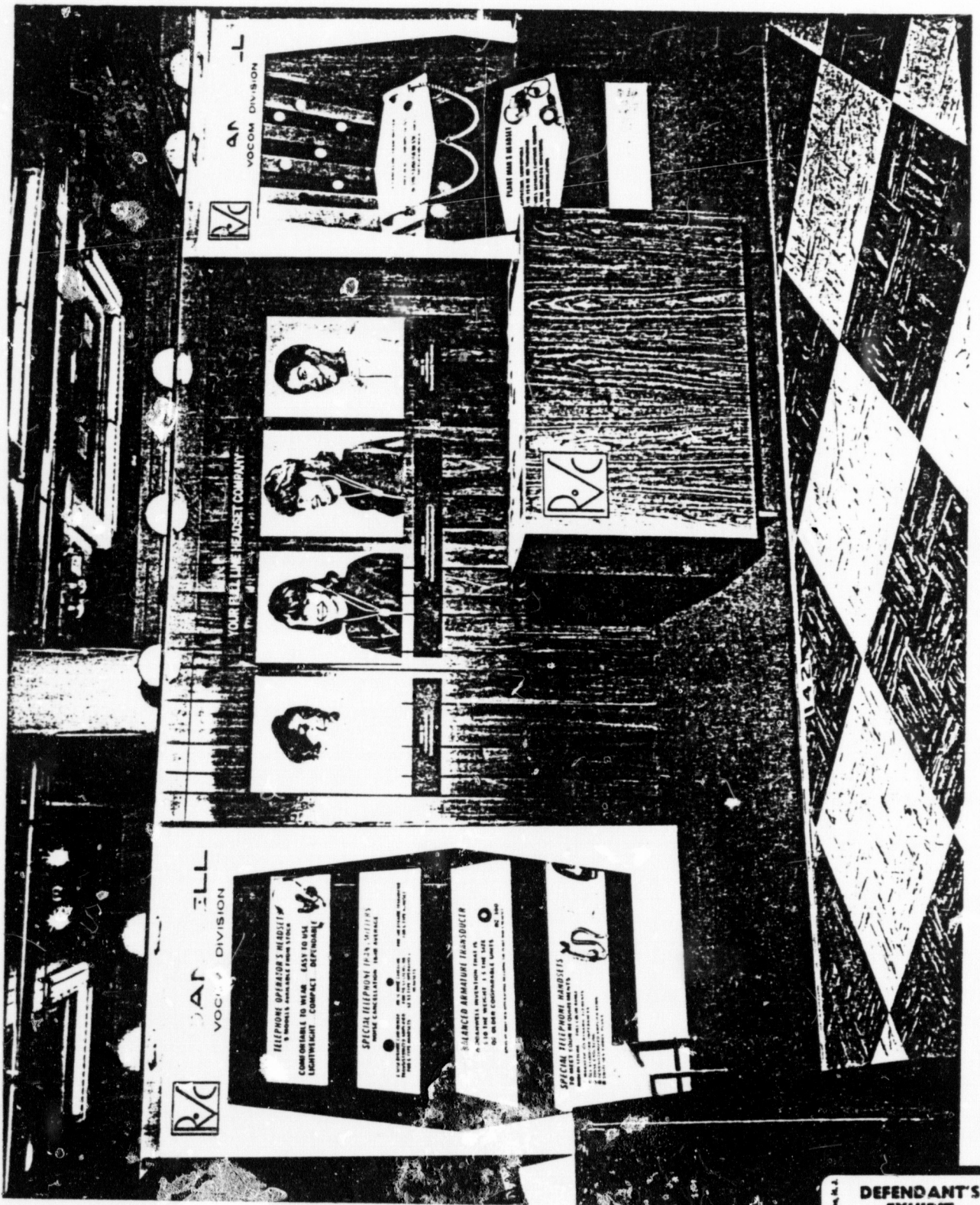
The R-70A is supplied with five flexible ear inserts of varying sizes. The selection of ear inserts is intended to provide each operator with as comfortable a fit as possible.

Several electronic amplifier options are available, each housed in the R-70A plug assembly. Features include elimination of background noise and gain compensation over a wide range of operating voltage and input signal conditions.



ROANWELL CORPORATION 180 Varick Street, New York, N.Y. 10014. • Tel: (212) 989-1090

887



282

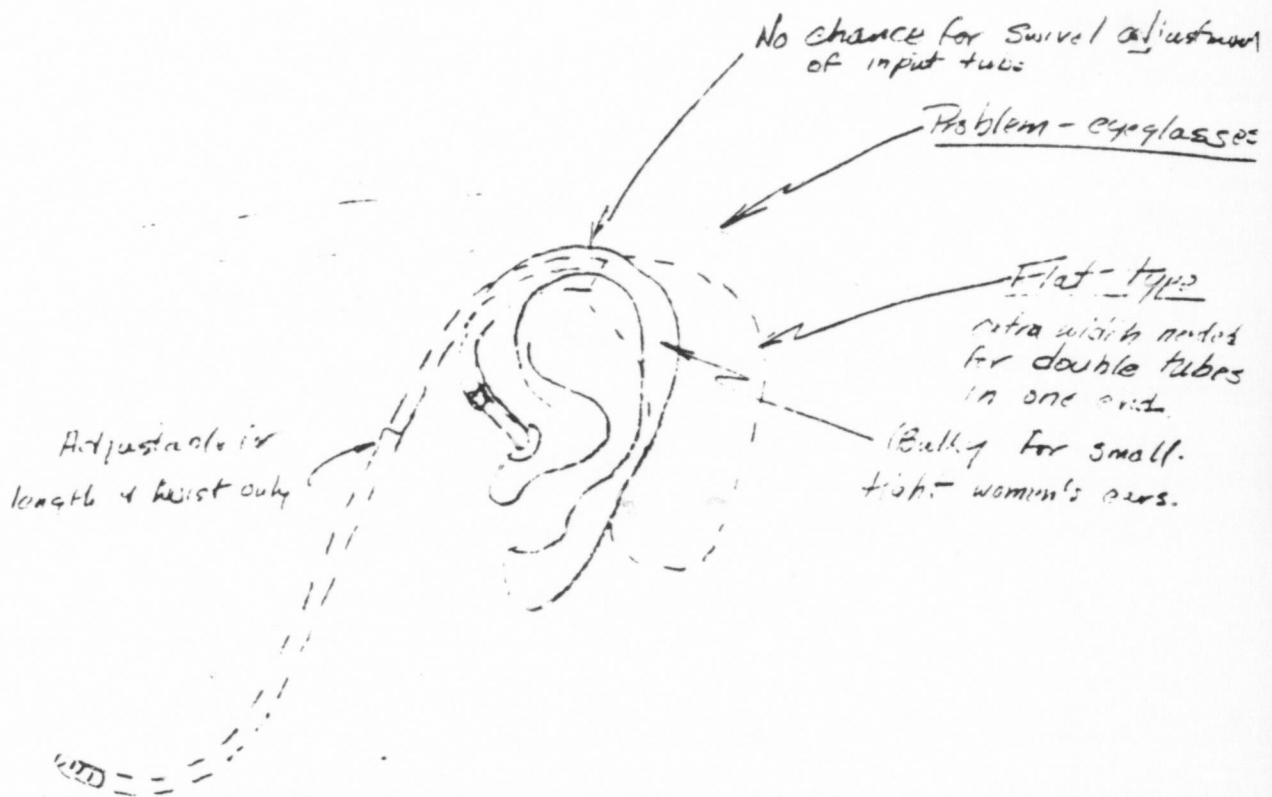
PENNSYLVANIA, N.Y.  
 DEFENDANT'S  
 EXHIBIT  
 NO. N-2



Sketch # 19

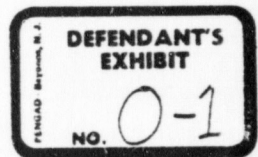
Over Ear Voice Input

Over Ear Output



(See Head-on Model)

883



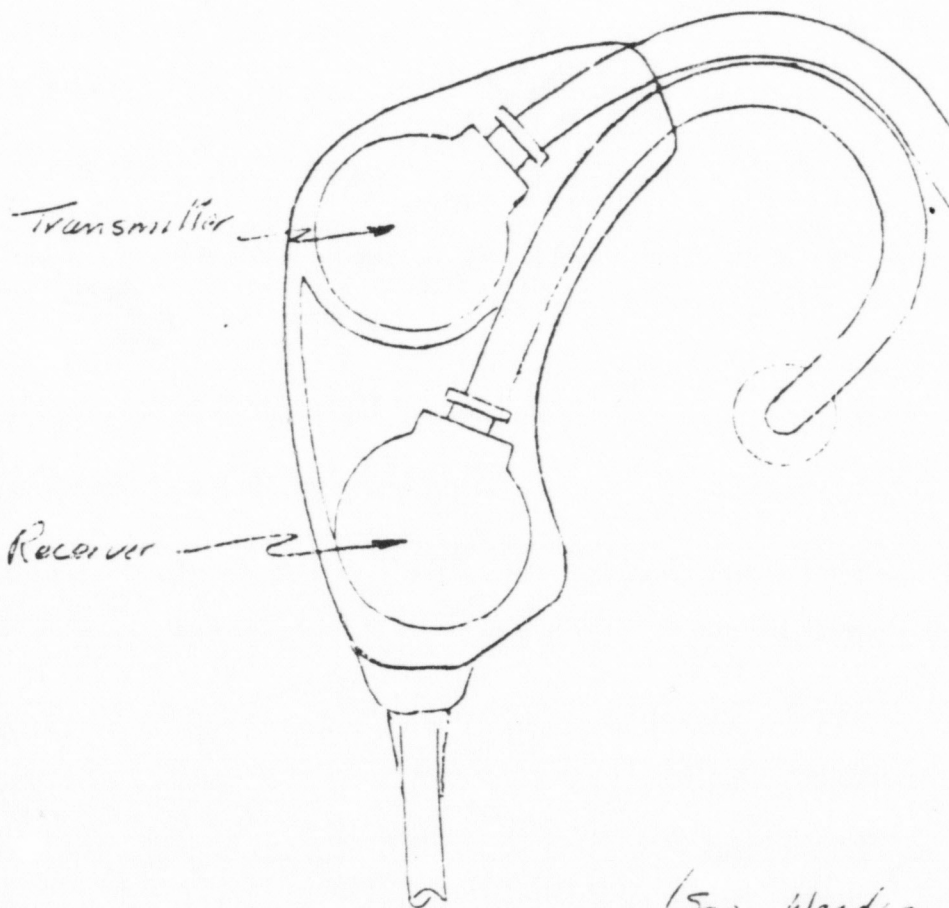
002483



Sketch #. 20

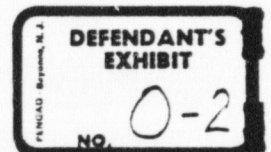
Flat Type -- Over Ear Voice Tube

BASIC Layout only



(See Wooden Model)

884



002482

PRIOR ART BOOK

RE

HUTCHINGS DESIGN PATENT DES. 218,173

1. Flygstad et al patent 3,280,273, granted October 18, 1966
2. Oticon hearing aid photograph and full-page ad from The Hearing Dealer, September 1968, page 4
3. Weiss patent 3,019,306, granted January 30, 1962
4. Maico undated sales flyer on its Selectronic I, Model BI, hearing aid, and a Maico ad for the Selectronic I in the National Hearing Aid Journal, December 1965, on the inside of the front cover
5. Qualitone ads in The Hearing Dealer, January 1961, page 23, and October 1962, page 18
6. Photocopy of a Vanco MINI-EAR hearing aid and two undated flyers on the MINI-EAR

EX. R-1

885

Oct. 18, 1966

D. W. FLYGSTAD ETAL

3,280,273

SELF-SUPPORTING OPERATOR'S HEADSET

Filed Sept. 11, 1963

2 Sheets-Sheet 1

FIG. 1



FIG. 2

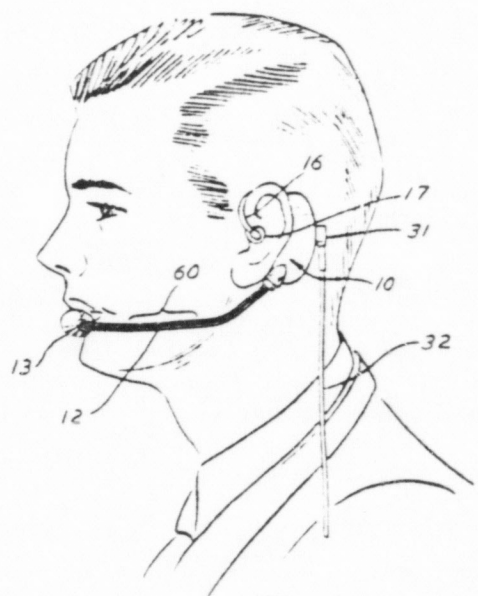


FIG. 3

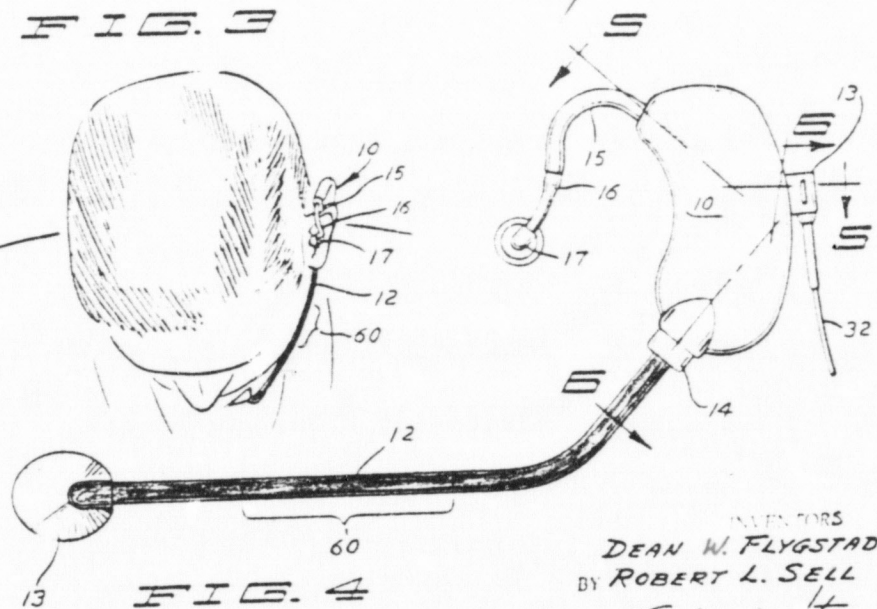
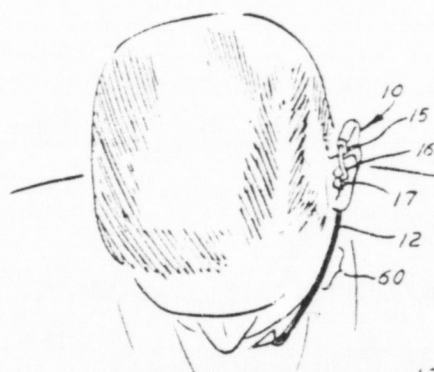


FIG. 4

INVENTORS  
DEAN W. FLYGSTAD  
BY ROBERT L. SELL  
Carlson, Carlson & Turner  
ATTORNEYS

886



Oct. 18, 1966

D. W. FLYGSTAD ET AL

3,280,273

SELF-SUPPORTING OPERATOR'S HEADSET

Filed Sept. 11, 1963

2 Sheets-Sheet 1

FIG. 7

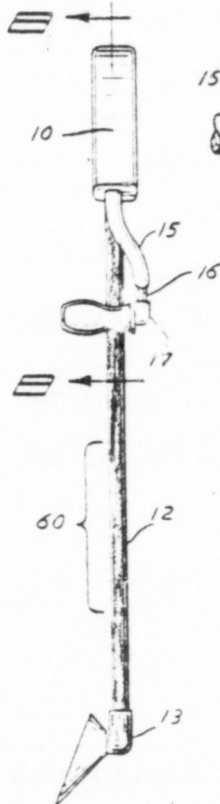


FIG. 5

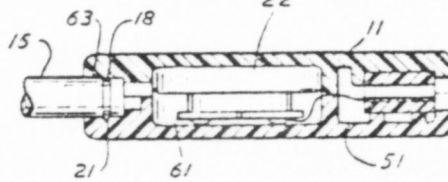


FIG. 6

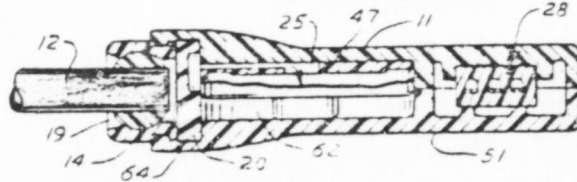


FIG. 8

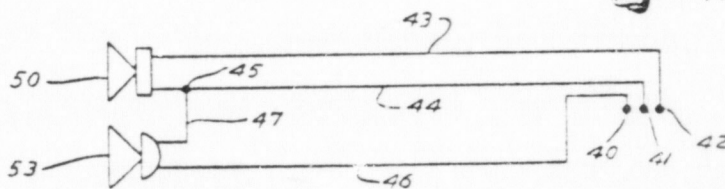
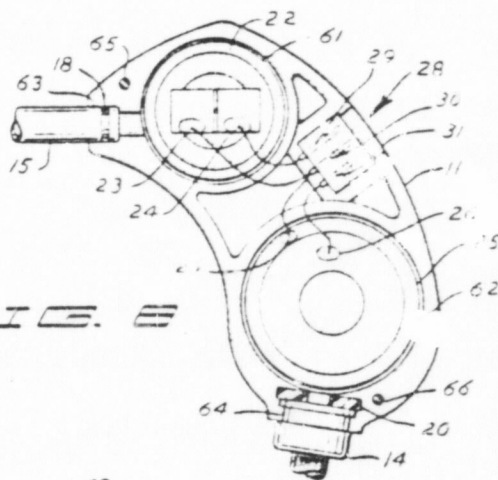


FIG. 9

INVENTORS  
DEAN W. FLYGSTAD  
BY ROBERT L. SELL  
Carlson, Carlson & Stuenkel  
ATTORNEYS

887

This invention relates generally to two-way communication apparatus and is more particularly related to apparatus containing a receiver and a microphone that is intended to be worn by an operator.

In the prior art with which this invention is concerned, much effort has been directed to provide lightweight, comfortable and efficient headsets to be used, for example, by telephone operators. One common feature found in the prior art is an intermediate supporting structure to hold a receiver in sound transmitting relationship with an operator's ear and a microphone in sound receiving relationship with an operator's mouth. One recent example of such supporting structure is a headband which extends up and across a substantial portion of the top of an operator's head. Another example supports the necessary apparatus on the bow, or temple member, of a pair of eyeglasses. In still another example, a receiver may be supported on a headband and a microphone may be supported in structure adapted to be suspended around the operator's neck. These and other examples of the prior art may be found lacking in one or more of the desirable features noted above.

In our invention, we have provided a novel and useful improvement in providing a self-supporting headset. Briefly, our apparatus includes a housing that has depending sound conducting members, for supporting and stabilizing the headset on the head of an operator, and a suitably mounted receiver and microphone, all of which coact to provide a combination of elements that is lightweight, comfortable and efficient.

It is therefore an object of our invention to provide a novel operator's headset.

It is a further object of our invention to provide a self-supporting operator's headset.

These and other more detailed and specific objects will be disclosed in the course of the following specification, reference being had to the accompanying drawings, in which—

FIGS. 1-3 illustrate a preferred embodiment in position on an operator's head.

FIG. 4 is a side elevational view of the preferred embodiment of our invention.

FIG. 5 is a sectional view taken along section lines 5-5 in FIG. 4.

FIG. 6 is a sectional view taken along section lines 6-6 in FIG. 4.

FIG. 7 is a plan view of the preferred embodiment of our invention.

FIG. 8 is a sectional view taken along section lines 8-8 in FIG. 7.

FIG. 9 is an illustrative electrical schematic drawing of the electrical portion of our invention.

Referring now to the drawings in which like reference numerals have been applied to like elements of our invention, there is shown a self-supporting operator's headset comprised of a housing 10 which may contain a receiver 22 and a microphone 25 that are appropriately positioned to coact with a forwardly extending tube member 15 and a second forwardly extending tube member 12. Tube member 15 is in turn connected to a further tube member 16 that is adapted to carry an ear insert 17. Tube member 12 is mounted in a ball 19 and socket 14 and extends forwardly from the lower end of housing

10 and carries at its forward end a megaphone 13. Tube 12 is adapted to engage the cheek of an operator at a point or points along its length as indicated by bracket 60.

As will be apparent from the drawings, housing 10 is comprised of a pair of substantially identical members 11 and 51 which, when suitably disposed, combine and coact to define a pair of acoustically independent transducer mounting chambers 61 and 62 at opposite ends of the assembled housing 10. A further chamber is provided intermediate the acoustically independent chambers for mounting a three-terminal jack, indicated generally by the reference character 28.

Chamber 61 is adapted to receive and hold a receiver 22 having a pair of input terminals 23 and 24 that are connected through suitable conducting means to a further pair of terminals 29 and 30 on jack member 28. Chamber 61 also includes a forwardly extending aperture 63 which is adapted to receive the end of tube member 15.

Chamber 62 is adapted to receive and mount a microphone 25 which is provided with a pair of output terminals 26 and 27 that are connected through suitable conductors to terminals 30 and 31 on jack member 28. Chamber 62 also includes a generally forwardly extending aperture 64 for receiving socket 14 and sound baffling member 20. A further sound baffling member 47 is shown positioned at the bottom of chamber 62 on member 11. Sound baffling member 20 includes a first slot extending completely through and a second groove extending partly through member 20 to define an opening which is adapted to coact with a radially extending channel on the lower surface of baffling and gasket member 47, which in turn is in communication with a centrally located aperture for transmission of sound to microphone 25.

Member 11 also includes upwardly extending locating pin members 65 and 66 which are adapted to coact with similarly positioned apertures in member 51 to provide suitable registration of members 11 and 51 for assembling the apparatus. Members 11 and 51 may be assembled to form housing 10 after receiver 22, microphone 25, baffles 47 and 20 and jack 28 are positioned and suitably interconnected and may be cemented together through the use of any suitable adhesive which will provide the desirable acoustical insulating properties to ensure acoustical isolation between chambers 61 and 62.

Tube 15, which may be comprised of any suitable semi-rigid plastic material, is provided with a groove 18 which may coact with a pin member 21 mounted in member 51 so as to allow rotation of tube member 15 in aperture 63. Tube member 15 is, in turn, connected to a further tube member 16, which may be of a pliable material. An earplug 17 is shown mounted on the end of tube 16 and may be of suitable shape and compliance to be comfortably inserted in the auditory canal of an operator.

Tube member 12 is held in ball 19 through the use of a suitable adhesive. Ball member 19 is in turn rotatably journaled in a socket 14 which is in turn positioned and held in aperture 64 at the lower end of housing 10. Tube member 12 may also be comprised of a semi-rigid plastic material and has mounted at its forward end a megaphone 13 that is adapted to receive sound from the mouth of an operator and may be of any suitable size and shape.

In FIG. 4 of the drawing a suitable three-conductor plug member 31 is shown in position on jack 28 and is in turn connected to a suitable cable 32 that may be connected to suitable communication equipment which includes a source of signal and signal utilization means.

In FIG. 9 an electrical schematic representative of circuitry that may be employed with our invention is shown. A three-terminal plug represented generally by

888



reference characters 40, 41 and 42 is shown connected in circuit with a microphone 53 and a receiver 50, each of which has a pair of terminals. One of the terminals on receiver 50 is connected to terminal 41 through conductor 44 and is also connected to one of the terminals on microphone 53 through terminal 45 on conductor 44 and conductor 47. The other terminal on receiver 50 is connected to terminal 42 through conductor 43. The second terminal on microphone 53 is connected to terminal 40 through conductor 46.

It may thus be seen that our invention broadly includes a housing 10 which may have a first forwardly extending tube member 15 and a second forwardly extending tube member 12 and a jack 28 for connection to suitable communications equipment through cable 32.

Referring now to FIGS. 1, 2 and 3, our invention is shown in position on the head of an operator. Housing 10 is positioned directly behind the ear of the operator and tube member 15 extends forwardly to lie on the top of the ear and thence downwardly to provide a coupling to the auditory canal of the operator. Tube member 12 extends forwardly into engagement with the cheek of the operator along the area indicated by reference numeral 60 and the megaphone 13 is positioned in proximity to the mouth of the operator in a position which will provide for the most efficient transfer of intelligible sound energy from the particular operator using our apparatus.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described our invention, what we claim to be new and desire to protect by Letters Patent is:

1. An operator's headset comprised of an elongated hollow housing containing a receiver and a microphone, said housing being shaped to lie behind the ear of an operator, said housing also having a tubular portion extending forwardly from its top over the ear of an operator and into proximity of the auditory canal, said housing also having a tubular portion extending forwardly from its lower end into contact with the face of the operator and into proximity of the mouth of the operator whereby the housing is supported solely by the ear and face of the operator.

2. An operator's headset comprising: a housing having a portion adapted to engage the back of the ear of an operator, said housing being vertically elongated and having separate chambers in proximity to the top and bottom ends thereof, each of said chambers having an aperture extending generally forwardly thereof; a microphone in the bottom chamber; a receiver in the top chamber; a tube extending forwardly of the aperture in said top chamber to lie on top of the ear and downwardly to extend into the auditory canal of an operator; a further tube extending generally forwardly of the aperture in said bottom chamber, said tube being adapted to lie on the cheek and extend into proximity of the mouth of an operator.

3. The apparatus of claim 2 in which the further tube is pivotally mounted in the aperture in said bottom chamber.

4. The apparatus of claim 3 in which the tube extend-

ing from the top chamber is rotatably journaled in the aperture.

5. The apparatus of claim 2 in which first and second resilient gaskets, each having sound energy transmitting channels and apertures, coact to provide a conduit for the transmission of sound from the aperture on the bottom end of the housing to the diaphragm of the microphone mounted therein.

6. An operator's headset comprising in combination: a hollow housing including terminal means for connection to a source of signal and a signal utilization means, said housing being of generally arcuate shape to lie behind and engage the ear of an operator; a first forwardly and downwardly extending tube member at the top of said housing, said tube member being adapted to engage the ear of an operator along a portion of its length and cooperating therewith to support the housing on said ear; sound receiving means electrically associated with said terminal means, and associated with said tube member to supply sound energy to the auditory canal of an operator; a second forwardly extending tube member at the bottom of said housing, said tube member being adapted to engage the side of the face of an operator and having an opening adapted to be positioned in sound receiving relationship to the mouth of an operator; and microphone means electrically associated with said terminal means and associated with said second tube member to receive sound energy from the mouth of an operator.

7. An operator's headset comprised of a housing member adapted to abut the rear portion of an operator's ear; a forwardly extending tube member adapted to extend over the top of an operator's ear; a further tube member extending forwardly into proximity with the mouth of an operator and adapted to lie in engagement with the cheek of an operator, said housing and tube members cooperating to support and stabilize the headset on the ear of an operator.

8. Improved self-supporting communication apparatus comprising in combination: a microphone and receiver; a hollow housing including forwardly extending sound conducting members, one of said members being adapted to engage the top of the ear of an operator and to apply sound energy to said ear, and the other of said members extending into proximity of the mouth of an operator and being adapted to engage the cheek of an operator whereby said hollow housing is supported only by said sound conducting members; and means mounting said microphone and said receiver in said housing in acoustically independent relationship so that said one member provides sound energy to the ear of an operator and said further member receives sound energy from the mouth of the operator.

#### References Cited by the Examiner

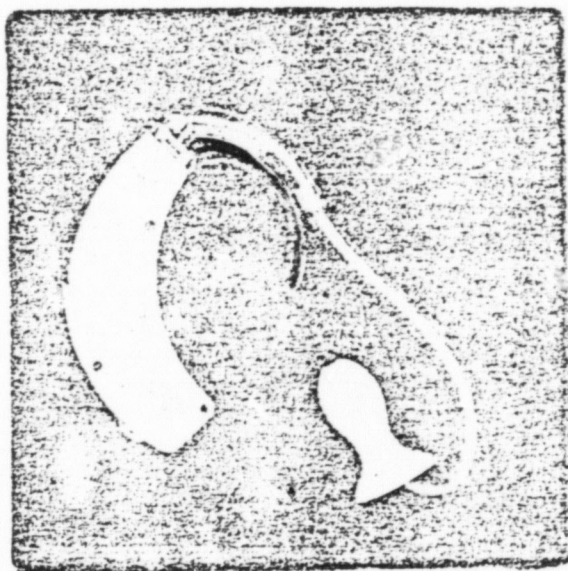
##### UNITED STATES PATENTS

2,904,640	9/1959	Dreher et al.	179-156
3,184,556	5/1965	Larkin	179-156

KATHLEEN H. CLAFFY, Primary Examiner.  
WILLIAM C. COOPER, Examiner.

889





EP 24/3  
Oticon Hearing Aid

890

# WHAT IS FOCAL SOUND?

FOCAL SOUND is a NEW method of improving sound collection and reception, designed by OTICON in the newest hearing aid design. The Sound is picked up in the focus of the auricle . . . NOT behind, in front, above or below the ear, BUT IN the ear.

- EXTRA 10 DB NATURAL GAIN FROM THE AURICLE
- IMPROVED DIRECTIONAL HEARING  
Fitted binaurally gives normal directional hearing ability.
- SIMPLICITY IN FITTING  
Special sound hook in new material is an integral part of the instrument. Needs no adjustment, no cutting. Fits any ear.
- REDUCED WIND NOISE  
Replaceable Windshield and dust filter.

Summaries of a series of investigations into directional hearing carried out with persons with normal hearing in a large anechoic room.

## MONAURAL



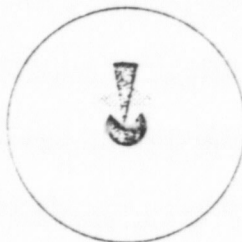
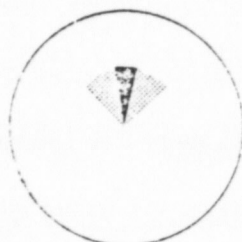
Normal directional hearing ability



Some directional hearing ability



No directional hearing ability

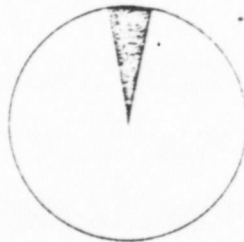
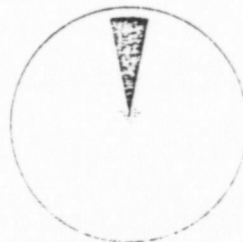
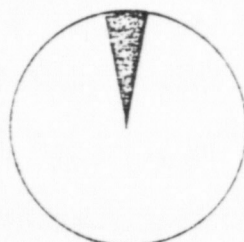


One ear (with no hearing aid): reaction time 10-20 seconds.

One hearing aid of conventional earett type: reaction time 30-60 seconds.

One Oticon 566 Focal Sound: reaction time 10-20 seconds.

## BINAURAL



Two ears (with no hearing aids): reaction time 5 seconds.

Two hearing aids of conventional earett type: reaction time 15 seconds.

Two Oticon 566 Focal Sound: reaction time 5 seconds.

When tested with the Oticon 566 FOCAL SOUND, the reaction time factor compares most favorably with normal hearing, and the results of binzural fitting as regards BOTH reaction time AND directional hearing ability are virtually the same as normal hearing.

Write or phone for further information today!



OTICON CORP. 999 STONE ST.  
UNION, N.J. 07083  
PHONE (201) 687-0353

891 HEARING DEALER

1968

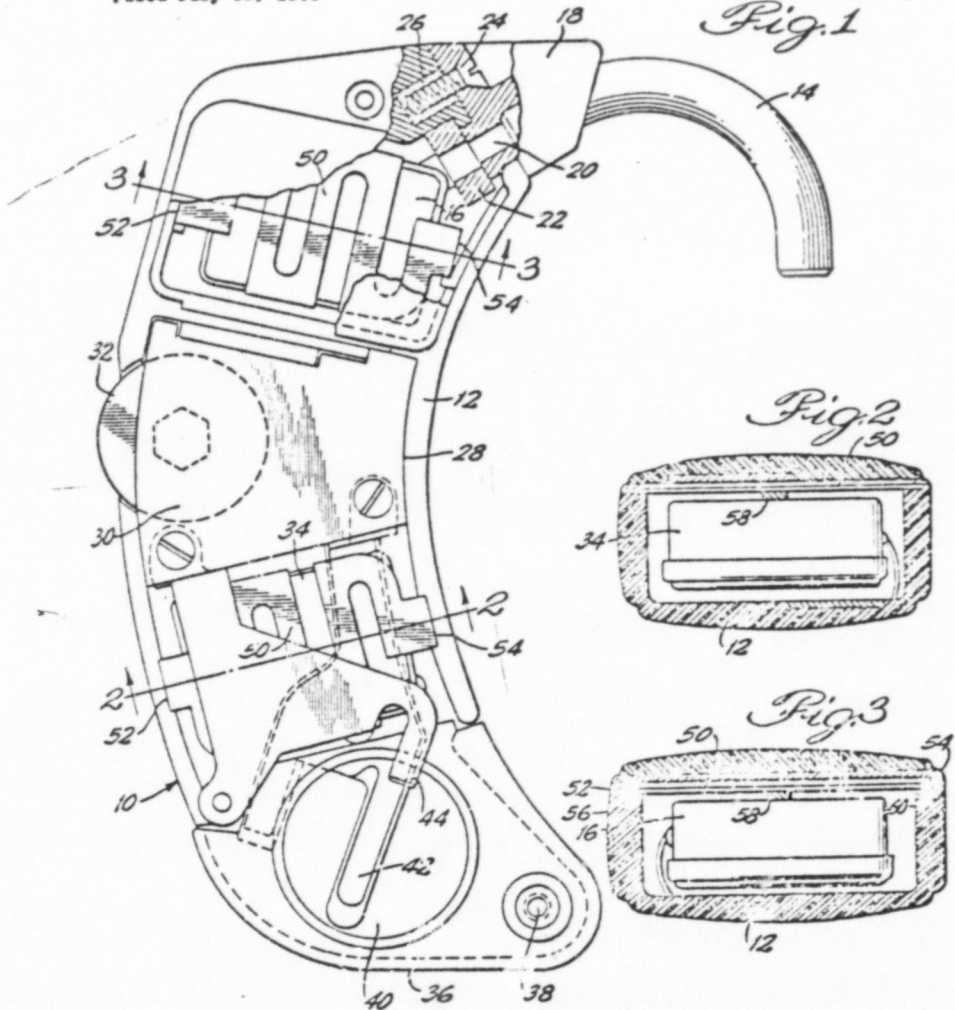
Jan. 30, 1962

E. M. WEISS  
TRANSDUCER SUSPENSION

3,019,306

Filed July 11, 1960

2 Sheets-Sheet 1



INVENTOR:  
*Erwin M. Weiss,*  
BY  
*Lair, Freeman & Molinari*  
ATTORNEYS.

892



Jan. 30, 1962

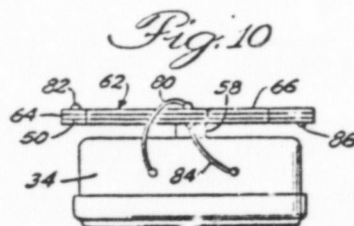
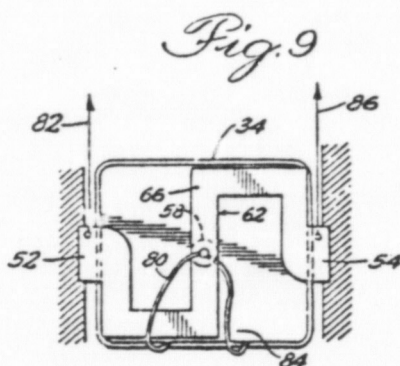
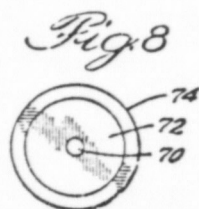
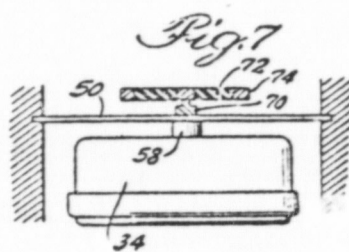
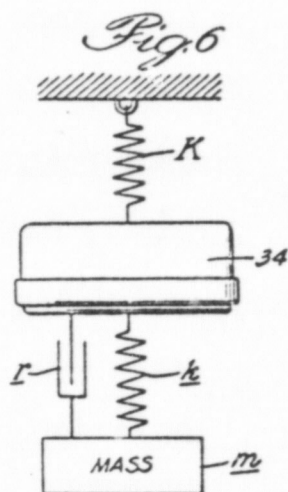
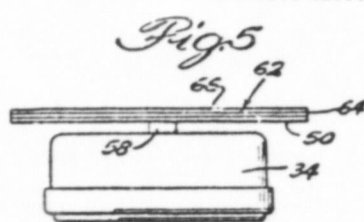
E. M. WEISS

3,019,306

TRANSDUCER SUSPENSION

Filed July 11, 1960

2 Sheets-Sheet 2



INVENTOR:  
*Erwin M. Weiss,*  
BY  
*Bair, Freeman & Molinare*  
ATTORNEYS.

893

1

3,010,306

## TRANSDUCER SUSPENSION

Erwin M. Weiss, Chicago, Ill., assignor to Beltone Hearing Aid Company, a corporation of Illinois  
Filed July 11, 1950, Ser. No. 42,152  
10 Claims. (Cl. 179-146)

This invention relates generally to transducer suspension means, and more particularly to a new and improved means for mounting a transducer in a case, as for example, the case of a hearing aid of the type adapted to be worn on the head or body of a hard-of-hearing person.

Prior art means for mounting transducers in compact electrical apparatus, such as hearing aids, have certain characteristics in common. For example, those skilled in the hearing aid art know that some type of visco-elastic substance generally is used to suspend a microphone and a receiver within a hearing aid case. In some instances, the substance may take the form of a porous blown natural or synthetic rubber, and in other cases, this substance may take the form of a sheath of solid rubber.

A transducer mounting of the first type comprising suspension members of blown rubber cemented between the hearing aid case and the transducer is shown in Patent No. 2,894,076 granted to Sam Pesen on March 17, 1959. In the second type of transducer mounting referred to above, the transducer is encased within a thin rubber enclosure and the entire assembly is positioned in the hearing aid case.

In order to provide proper isolation of a transducer within a rigid case, it is necessary that the visco-elastic substance interposed between the transducer and the case be very compliant. As a result, blown rubber mountings frequently are used but it is difficult to maintain uniformity therein due to the wide variations in the compliance characteristic which exists from batch to batch, and even from portion to portion within the same batch, in a blown rubber mounting.

Further, it usually is necessary to cement the blown rubber mounting to both the case and the transducer. Those skilled in the art appreciate that difficulties often arise from such an arrangement due to the tendency of the cement to rise by capillary action into the porous rubber material. As a consequence, the porous rubber material is stiffened considerably after the cement is dried and the compliant property which is desired is substantially lost. An additional difficulty arises where small sections of porous rubber are used in the form of buttons or washers. It is necessary to hold such parts to close dimensional tolerances due to the small size of the cavities in which the transducers are mounted, and it often is very difficult or even impossible to hold a piece of material with such poor dimensional stability as blown rubber to the desired close tolerances.

In those instances where a sheath of solid rubber is used to support a transducer within a case, other difficulties are encountered. For example, the compliance provided by such a solid rubber sheath is not very great, and consequently the transducer is not adequately isolated from case vibrations. Those skilled in the art appreciate that the poor isolation properties of a hard thin rubber sheath frequently necessitates considerable reduction in the average gain of the hearing aid.

It is further known that transducer mountings which utilize resilient rubber bumpers or washers form isolators which are compliant in horizontal as well as vertical modes. Thus, when a soft rubber bumper is used to support a microphone, the microphone tends to float sideways and as a consequence, the microphone may hit the case when the wearer moves his head sharply.

Accordingly, it is a general object of this invention to

2

overcome the above-stated difficulties which characterize the transducer mounting means of the prior art.

More particularly, it is an object of this invention to provide a new and improved transducer mounting means which is characterized by its uniform and lasting compliance properties, by its efficiency of isolation in a desired mode, and by its relatively simple and low cost construction.

In accordance with one specific illustrative embodiment of this invention, the novel transducer mounting means takes the form of a flat metallic spring which is shaped to provide considerable effective length in a small area. Advantageously, the flat metallic spring may comprise a plurality of beams connected in series with the opposed ends of the spring being fastened to the case and with the center beams being adapted to receive and support the transducer.

As explained in greater detail hereinbelow, the fundamental frequency of oscillation of the metallic spring isolator in combination with the transducer advantageously is made well below the lowest frequency to be amplified by the hearing aid. In addition, it is known that a transducer, such as a microphone, is much less sensitive to vibration in a horizontal plane than in a plane perpendicular to the diaphragm. The metallic spring isolator comprising the invention is made to be very stiff in a horizontal plane, but very compliant in the vertical plane so that a microphone may be supported in a small cavity with less concern about the problem of rapid head motion.

In accordance with a further feature of the invention, the metallic spring isolator is provided with particular damping means to prevent excitation into resonance at higher frequencies. Such damping means advantageously may comprise a visco-elastic substance sandwiched between the spring isolator and a thin sheet of metallic foil, or alternatively, it may take the form of a dynamic vibration absorber in which additional spring and mass means are secured to the spring isolator.

It is a still further feature of this invention to utilize the damped spring isolator as a two terminal electrical conductor to reduce lead breakage in the transducer. Thus, one electrical lead of the transducer is connected to the metallic spring of the isolator and the other electrical lead is connected to the metallic foil of the isolator. Since the connections are made at the geometric center of the suspension system when there is no relative movement between the transducer and the isolator, the leads are not caused to vibrate and breakage of the leads is substantially reduced.

The novel features which are characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and operation, together with further objects and advantages thereof, will best be understood by reference to the following description taken in conjunction with the accompanying drawings in which:

FIGURE 1 is a side elevational view of a behind-the-ear type of hearing aid, partly broken away and partly in section, embodying the present invention;

FIGURE 2 is a cross-sectional view of a microphone supported by a metallic isolator taken substantially as shown along line 2-2 of FIGURE 1;

FIGURE 3 is a cross-sectional view of a receiver supported by a metallic isolator taken substantially as shown along line 3-3 of FIGURE 1;

FIGURE 4 is a plan view of one specific illustrative embodiment of metallic isolator in accordance with the invention;

FIGURE 5 is an elevational view of a transducer supported by a damped metallic spring isolator;

FIGURE 6 is a schematic diagram of the electrical

894



equivalent circuit of a damping dynamic vibration absorber in accordance with the invention;

FIGURES 7 and 8 are elevational and plan views respectively of one specific illustrative embodiment of a damping dynamic vibration absorber type of transducer isolator in accordance with the invention; and

FIGURES 9 and 10 are plan and elevational views respectively of a damped transducer isolator embodiment in which the metallic elements of the isolator also serve as a two terminal electrical conductor to reduce transducer lead breakage.

Referring now to the drawing, and more particularly to FIGURE 1 thereof, there is shown one specific illustrative embodiment of hearing aid in which a portion of the cover has been removed from the case to better illustrate the internal construction of the hearing aid. The present invention is shown in this application as used with a hearing aid for illustrative purposes only, and it will be obvious to those skilled in the art that the invention finds equally advantageous use in other types of compact, electrical devices which utilize a transducer, such as a microphone, a receiver, and the like.

FIGURE 1 shows a hearing aid of the type sometimes referred to as a behind-the-ear model, which is adapted to be supported upon the ear with the main case of the hearing aid resting on the back portion of the ear. As shown, the hearing aid 10 comprises a case 12 which advantageously is of channel shape to receive the hearing aid component therein. An air tube 14 extends from the upper end of case 12 and serves to convey sound from a receiver 16 within the case to a further air tube which extends into the ear of the hard-of-hearing person.

Those skilled in the art will appreciate that the air tube 14 advantageously may be formed of a stiff plastic material so that it may be shaped to fit the ear and rest comfortably thereon. The air tube 14 advantageously is embedded within the end piece 18, and is in sound communication with the receiver 16 through the aperture 20 in the nubbin provided in end piece 18, and through the sealing ring 22 positioned between the nubbin and the receiver 16. Advantageously, the end piece 18 may be secured to the hearing aid case 12 by means of any suitable fastener, such as the threaded screw fastener 24 which is positioned within a suitable threaded opening 26 in the hearing aid case.

In addition to the receiver 16, the hearing aid within the case 12 comprises an amplifier and control portion 28 which is positioned immediately adjacent the receiver portion 16. While the amplifier and control portion 28 is shown in FIGURE 1 as having a cover 30 thereover, it will be appreciated that the amplifier and control portion 28 may comprise any suitable transistorized amplifier and volume control assembly, the volume control being adjustable externally by means of volume control knob 32.

A microphone 34 is positioned adjacent the amplifier and control portion 28, and a combined On-Off switch and battery holder 36 is positioned adjacent the microphone. Advantageously, the combined On-Off switch and battery holder 36 is pivotally attached to the hearing aid case by means of the pivot member 38 so that the switch and battery holder 36 may be actuated to turn the hearing aid On or Off, or further actuated to be withdrawn from the case for replacement or checking of the battery. The switch and battery holder 36 is provided with the suitable central aperture 40 adapted to receive a battery therein and a pair of contacts 42 and 44 are provided for engaging the battery terminals in a selective manner to control the energized condition of the hearing aid.

While the details of the hearing aid shown in FIGURE 1 are described for purposes of illustrating one specific preferred embodiment of the invention, manifestly, the invention is not limited to the hearing aid of FIGURE 1 and may be used with equally advantageous results in

other hearing aids as well as other compact electrical structures employing transducers.

In accordance with a salient feature of this invention, the transducers of the hearing aid are suspended within the case in a unique and highly advantageous manner. The novel suspension means differs from the visco-elastic isolators and suspension means of the prior art and overcomes the difficulties associated therewith, as described in detail hereinafter.

One specific illustrative embodiment of transducer suspension means in accordance with the invention is shown in FIGURES 1, 2, 3, and 4, of the drawing. Advantageously, this illustrative embodiment takes the form of a flat, metallic spring which preferably comprises a plurality of sinuous beams and which further comprises an isolator secured to the geometric center of the flat, metallic spring for supporting the transducer in non-contacting relation with the spring and with the walls of the transducer case.

The nature of the properties required for a transducer suspension member of the type contemplated by the present invention are as follows. First of all, the fundamental frequency of oscillation of the suspension member in combination with the transducer must be well below the lowest frequency being amplified by the electrical device. For example, in the case of a hearing aid in which the lowest frequency being amplified is approximately 400 cycles, the transducer suspension member in combination with the transducer should have a natural period of oscillation of no greater than 100 cycles per second. Secondly, those skilled in the art will appreciate that a transducer, such as the microphone, is much less sensitive to vibration at a plane parallel to the microphone diaphragm than in a plane perpendicular to the diaphragm. As a result, the transducer suspension member advantageously is made very stiff in a horizontal plane but very compliant in the vertical plane. This requirement is admirably met by the present invention since the flat, sinuous, metallic spring has much greater stiffness in the plane in which vibration isolation is not required.

One practical result of this unique arrangement is the use of smaller cavities for the transducers. Thus, a microphone in the hearing aid, when suspended by the invention, may be placed in a small cavity with much less concern about the problem of rapid head motion than is the case with present day transducer suspension members.

A still further advantage of the flat, metallic transducer suspension member of the present invention is the fact that its properties can be held to very close tolerances. Thus, metallic materials, such as stainless steel, do not deteriorate with time as is the case of sponge rubber or other visco-elastic materials, and therefore the suspension member can be maintained to a desired degree of performance.

In the specific illustrative embodiments of transducer suspensions shown in FIGURES 1 to 4, the transducer suspension member 50 is a flat, metallic spring which is sinuous in shape and which is provided at its ends with the terminal pieces 52 and 54, respectively. The sinuous shape of the transducer suspension member 50 is highly advantageous to give the suspension member a greater effective length in a relatively small area. Those skilled in the art will appreciate that this action of the suspension member 50 may be viewed as the action of several springs in tandem. Effectively many beam means are provided in series to permit efficient isolation of the transducer from case vibration.

As shown in FIGURES 1, 2, and 3 of the drawing, the terminals 52 and 54 of the transducer suspension member 50 are positioned on the shoulders 56 and 58, respectively, of the transducer cavity provided in the hearing aid case. The transducer suspension member 50 can be held in position by any suitable means and the cover of the case is positioned thereover to maintain the suspension member securely in its desired position.

895



FIGURE 2 shows the microphone 34 of the hearing aid as suspended from the transducer suspension member 50 by means of the isolator or separator element 58. Similarly, FIGURE 3 shows a receiver 16 of the hearing aid as suspended from the transducer suspension member 50 by means of the isolator element 58. In accordance with a feature of this invention, the isolator element 58 is mounted at geometric center of the transducer suspension element 50 so that the transducer is in non-contacting relationship with the suspension member 50 and further in non-contacting relationship with the walls of the transducer cavity in the case 12.

Due to the low internal damping of the flat metallic transducer suspension members 50, there is a possibility that such a member may be excited into substantial resonance at higher frequencies. In accordance with a further embodiment of this invention, such oscillation or vibration at higher frequency modes may be suppressed by providing sufficient damping for the metallic spring suspension member. Thus, as illustrated in FIGURE 5 of the drawing, a transducer such as the microphone 34 may be suspended by the isolator 58 from a transducer suspension member 62 of damped construction. As shown in FIGURE 5, the transducer suspension member 62 advantageously comprises a layer of visco-elastic material 64 which is sandwiched between a flat, metallic spring member 50 and a very thin layer of stiff constraining material, such as a sheet of aluminum foil 66. Those skilled in the art will readily appreciate that the damping action provided by the damped suspension member arrangement of FIGURE 5 will serve to inhibit or suppress any tendency of the transducer suspension member to vibrate at higher frequencies.

A still further embodiment of the invention which is adapted to provide greater isolation at frequencies above the natural period of the spring is shown in FIGURES 6 and 7 of the drawing. As illustrated in these figures, this embodiment comprises the transducer suspension element 50 described hereinabove, and an isolator or spacer 58 secured to the suspension member, which in turn supports a transducer, such as a microphone 34. In addition to these elements, which correspond to the constructions described in respect to FIGURES 1 through 4, this embodiment further comprises an additional spacer or isolator 70 secured to the opposite side of the transducer suspension member 50 for supporting an additional spring and mass arrangement to provide damped dynamic vibration absorption.

The equivalent circuit for the damped dynamic vibration absorber is shown in FIGURE 6 of the drawing wherein the microphone 34 is shown as suspended by a spring element K. Spring element K corresponds to the spring suspension provided by the transducer suspension member 50. Suspended from the microphone 34 is shown an additional spring  $k$  and an additional damping means  $r$ , shown in parallel and supporting an additional mass  $m$ . The additional spring damping means and mass are provided in one practical form of such a suspension by a thin, rubber disc 72 mounted on the isolator 70. The additional mass  $m$  is provided by the actual effective mass of the rubber disc 72 and the additional spring  $k$  is provided by the compliance of the rubber disc 72 when it vibrates in the "umbrella mode."

In another embodiment of the damped dynamic vibration absorber arrangement, the total mass would be the actual effective mass of the rubber disc 72 in addition to the mass of an annular lead ring 74 positioned around the rubber disc 72. Thus, the mass element  $m$  could be provided by a rubber disc alone or by the combination of a rubber disc and a metal ring therearound.

One typical value for such mass would be approximately  $\frac{1}{2}$  of the mass of the transducer. Thus, in a microphone having a mass of 2 grams, for example, the mass of the damped dynamic vibration absorber element would be approximately  $\frac{1}{2}$  of a gram.

While many other embodiments of transducer suspension members will be suggested in accordance with the teachings of the present invention, the above specifically described embodiments are merely illustrative of several practical forms of the invention to comply with the requirements of the patent statutes.

In addition to overcoming many of the problems of prior art visco-elastic transducer suspension members, the transducer suspension member of the invention also may be used in providing highly efficient acoustic isolation between a receiver and a microphone in a hearing aid case. Thus, those skilled in the art know that a certain amount of the acoustic output from the receiver normally is incident upon the microphone within the same hearing aid case. Some of this output comes from the leaks around joints, which usually are in the places where the receiver is connected to the nubbin.

The output then travels to the microphone through the case cavity. Some acoustic output may be radiated into the case cavity from the vibration on the walls of the receiver itself. If a receiver in a hearing aid is viewed as a miniature loud speaker, it can be appreciated how sound pressure developed in the receiver can vibrate the walls of the receiver case. This acoustic output adds to the acoustic output leaks and also reaches the microphone.

In accordance with a feature of this invention, such acoustic feedback may be reduced for transducers suspended by flat, metallic spring suspension members 50 by placing the entire receiver in a sealed cavity with stiff walls, or by molding a simple acoustic attenuator into the hearing aid case. In the latter, such an attenuator may take the form of a quarter-wave acoustic trap for frequencies at which the receiver develops its peak output.

Another highly advantageous embodiment of the invention is illustrated in FIGURES 9 and 10 of the drawing. Those skilled in the art will readily appreciate that the vibration of a transducer during its normal operation frequently results in breakage of the relatively thin transducer electrical leads. This serious problem is overcome in accordance with a feature of the invention by the utilization of the metallic elements of the damped vibration isolator of FIGURE 5 as two terminal electrical conductors. Thus, as shown in FIGURES 9 and 10, the transducer 34 normally is provided with the electrical conductor leads 80 and 84. One lead 84 is electrically connected to the metallic spring member 50 of the suspension member 62 and the other lead 80 is electrically connected to the sheet of metallic foil 66 positioned on the layer of visco-elastic material 64 opposite the spring member 50.

Preferably, the point of connection for each of the leads is at the geometric center of the suspension system. Since there is no relative motion between the transducer 34 and the geometric center of the suspension system the leads 80 and 84 are not caused to vibrate and the breakage problem is substantially reduced. The electrical output from the transducer 34 is obtained from the two conductors 82 and 86 attached to the extreme ends of metallic elements 66 and 50 respectively. As the extreme ends of the spring 50 are supported by the case wall, there is no relative motion on these points. Consequently, relatively heavy electrical leads 82 and 86 may be affixed in a suitable manner at these points to carry the electrical output from the transducer to the electrical amplifying system of the hearing aid or other compact electrical device.

While there has been shown and described a particular embodiment of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention and, therefore, it is intended in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What I claim as my invention is:

1. The improvement of transducer mounting means for supporting a transducer within a hearing aid case comprising a plurality of sinuous, series connected beams secured to the walls of a transducer cavity within the case, a transducer, attachment means secured to said beams and supporting said transducer in non-contacting relation with said beams within said transducer cavity, said transducer also being supported by said attachment means in non-contacting relation with the walls of said transducer cavity.

2. The improvement of transducer mounting means for supporting a transducer within a cavity in a hearing aid case comprising flat, metallic beam means, said beam means comprising a plurality of series connected beams having a pair of opposed terminal ends secured to the walls of said case, a transducer, attachment means secured to said beam means and to said transducer for supporting the latter in non-contacting relation with said beam means within said transducer cavity.

3. The improvement of transducer mounting means for supporting a transducer within a hearing aid case comprising flat, resilient beam means secured to the walls of a transducer cavity within the case, a transducer, separator means geometrically centered on said beam means and supporting said transducer in non-contacting relation with the walls of said transducer cavity, and damping means secured to said beam means for damping vibrations at higher frequencies to prevent said beam means from becoming excited into resonance at such higher frequencies.

4. The improvement of transducer mounting means in accordance with claim 3 wherein said damping means comprises a layer of a visco-elastic material adjacent said beam means and a sheet of stiff constraining material positioned on the visco-elastic layer.

5. The improvement of transducer mounting means in accordance with claim 4 wherein said sheet of stiff constraining material comprises a sheet of aluminum foil.

6. The improvement of transducer mounting means for supporting a transducer within a hearing aid case comprising flat, metallic beam means secured to the walls of a transducer cavity within the case, a transducer, first isolator means located at the geometric center of one side of said beam means and supporting said transducer in

non-contacting relation with the walls of said transducer cavity, second isolator means located at the geometric center of the other side of said beam means, and damped dynamic vibration absorber means supported by said second isolator means.

7. The improvement of transducer mounting means in accordance with claim 6, wherein said damped dynamic vibration absorber means comprises a thin resilient disc, the mass of said disc serving as the mass of the vibration absorber means and the compliance of said disc serving as the spring of said vibration absorber means.

8. The improvement of transducer mounting means in accordance with claim 7 further comprising an additional mass for said vibration absorber means formed of an annular lead ring mounted around said resilient disc.

9. The improvement of transducer mounting means for supporting a transducer within a case containing electrical circuitry comprising flat, resilient, metallic beam means secured to the walls of a transducer cavity within the case, a transducer, separator means secured to said beam means and supporting said transducer in non-contacting relation with the walls of said transducer cavity, damping means secured to said beam means for damping vibrations at higher frequencies, said damping means comprising a layer of visco-elastic material positioned on said metallic beam means and a sheet of thin metallic foil positioned on said visco-elastic layer, and means connecting one electrical lead of said transducer to the metallic beam means and the other electrical lead of said transducer to the sheet of metallic foil whereby the latter serves as two conductive terminals for connecting said transducer to the remainder of the electrical circuit.

10. The improvement of transducer mounting means in accordance with claim 9 wherein said transducer electrical leads are connected to the geometrical centers of said beam means and metallic foil sheet to minimize vibration of said leads and thereby reduce lead breakage problems.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

2,260,727      Sears et al.      Oct. 28, 1941

##### FOREIGN PATENTS

104,229      Sweden      Apr. 14, 1942

897



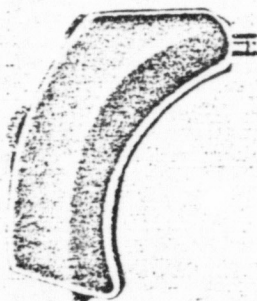
# Maico

## Selectronic I

PRECISION TUNED HEARING AID

MODEL

BI



### MAICO SELECTRONIC I Behind-the-Ear Hearing Aid

#### FEATURES

MEDIUM GAIN AND LOW POWER  
OUTPUT  
TELEPHONE PICKUP (OPTIONAL)  
SEPARATE VOLUME CONTROL  
AND ON-OFF SWITCH  
TEMPERATURE STABILIZED  
CIRCUITRY  
FOUR LO-CUT TONE SELECTORS  
THREE COMFORTABLE SOUND  
GOVERNORS

CONTOURED TO FIT SECURELY  
BEHIND THE EAR  
DESIGNED FOR MONAURAL OR  
BINAURAL USAGE  
PREFORMED TUBING CONNECTOR  
PERSPIRATION RESISTANT  
CONSTRUCTION  
VERY LOW OPERATING COST

#### SPECIFICATIONS

	S41E	RM41GH
ACOUSTIC GAIN (Maximum):	53 db	48 db
ACOUSTIC GAIN (1000 cps):	44 db	39 db
ACOUSTIC GAIN (HAIC) (Maximum):	43 db	38 db
POWER OUTPUT (Maximum):	117 db	115 db
POWER OUTPUT (HAIC):	115 db	113 db
FREQUENCY RANGE (HAIC):	340 - 4500 cps	
BATTERY LIFE	420 hrs.	525 hrs.

PART NO. 316 - MODEL BI

TRANSMITTER COMPLETE  
WITH CASE  
(EARMOLD NOT INCLUDED)

898



MODEL

BE

# Selectronic I

PRECISION TUNED HEARING AID

Maico

## REPLACEMENT PARTS AND ACCESSORIES

PART NUMBER		ITEM
BROWN	FLESH	
316A	316F	SELECTRONIC I TRANSMITTER
316T-A	316T-F	SELECTRONIC I TRANSMITTER WITH TELEPHONE PICKUP
6349A	6349	TONE SELECTOR, BLUE
6351A	6351	TONE SELECTOR, YELLOW
6352A	6352	TONE SELECTOR, ORANGE
6353A	6353	TONE SELECTOR, PURPLE
6235		TUBING CONNECTOR (KIT OF 10)
4779		EAR PIECE, CLEAR
RM41GH		BATTERY, MALLORY
S41E		BATTERY, EVEREADY
6335		RETAINER RING KIT
6354		PRESENTATION CASE
6345		COMFORTEAR SOUND GOVERNOR, BROWN
6346		COMFORTEAR SOUND GOVERNOR, YELLOW
6347		COMFORTEAR SOUND GOVERNOR, RED

899

# Why did several other hearing aid manufacturers ask Maico about this new hearing aid?



## 500 hours battery life, that's why.

Who ever heard of a full-performance at-the-ear hearing aid with battery life of OVER 500 HOURS? Nobody. Until now. And now they're hearing plenty about it. Maico dealers have it, and are selling it on operating cost—something that never used to make enough difference to be a selling point.

Maico is widely known as the company that offers its dealers more solid selling help than any other (you remember: "the company that HELPS THE DEALER SELL"—and doesn't just *sell the dealer*"). Once in a while we also like to remind you that we take a back seat to *nobody* in the development of exciting, saleable new hearing aids. Like the "Selectronic I", with over 500

hours of battery life. Only Maico dealers have it (and quite a few of our competitors aren't even sure it's real, yet).

Like to know more about Maico? There are some select territories open. Write Andy Harvey, general sales manager.



Dept. 1215-S 21 North 3rd Street, Minneapolis, Minn. 55401

900



OUR KEY TO INCREASED SALES IN '61



Smaller and lighter than ever before!

QUALITONE'S SENSATIONALLY  
SMALLER, AND LIGHTER-THAN-EVER  
EAR-LEVEL INSTRUMENT...

Cuts inventory costs in half because it  
fits either ear!

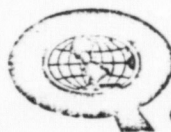
Can be used for mild or heavy losses!

## COMPARE THESE NEW-QUALITONE FEATURES THAT MAKE SELLING EASIER:

[Also available at no extra cost—Special White Dot circuit for difficult nerve losses.

for full line product leadership, instruments that  
sell easier, better dealer profits and benefits!

This can be the most rewarding  
decision you've ever made!



**QUALITONE**  
WORLD WIDE HEARING SERVICE

Qualitone Hearing Aid Co.  
Linden Hills Station  
Minneapolis 10, Minnesota

- ☐ Send confidential information about Qualitone.
- ☐ Send Sub-Miniature on 10-day return-privilege trial.
- ☐ Send special White Dot Sub-Miniature for nerve losses on 10-day return-privilege trial.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_

901



# SHAA

## ..... Bulletin

Fre

### Y'All Come

■ You've heard the story, you've read the news: It's time for the SHAA Annual Meeting!

By the time you receive this publication you have just the time left before the opening gavel to pack a toothbrush, snag a plane, and get to Chicago. But do it! You'll never regret it. If you miss the first day — don't miss the second. Just be there!

Look at that list of seminar subjects! Bet you wish you could attend all of them. Pick the four most important to you. Cover them.

Look at the list of speakers. The entertainment. The gathering of the hearing aid clan.

It's the event of the year.

Come one, come all — you sure don't have to be a member of the Society of Hearing Aid Audiologists to attend. You're welcome.

The SHAA wants you there. The SHAA sincerely wants to be instrumental in helping every hearing aid dealer to know more about his or her job. The SHAA honestly believes that the better informed a

dealer is, the more ethical will be his or her performance — the more sincere his or her service to America's hard of hearing. That's why it welcomes member and non-member alike. That's why you can come to this meeting no matter how long you have been in the business — or how deeply you are involved. It's for you!

Why does the Society want you to be informed, so that you can be even more ethical? Simply because we are all in this business together. Any act, by member or non-member, if it is unethical reflects on the entire industry — not just on those who are not yet certified by the SHAA. That's why the Basic Home Study Course in Hearing Aid Audiology is available to everyone — applicants for certification and non-applicants alike.

So, here it is—the annual moment of truth for hearing aid dealers. Will you advance yourself in your chosen field? Will you help to prepare yourself for the next step in your career? Will you attend



by D. Dale Hughes

Executive Director  
Society of Hearing Aid Audiologists

THE INTERN-  
of the fine  
world's larg  
also know  
fields of  
monitoring  
takes top  
neved a  
if most con  
NOW IN THE  
years of wor  
research an  
a complete  
instruments  
leading post  
ers And, as  
his profits gr

this prime educational event with your entire industry might advance.

We hope you will. We hope to see you in Chicago, at the Sheraton House, on November 8 through 10. You'll be glad you came.

### YOU'LL MAKE MORE SALES WITH QUALITONE!

Qualitone Instruments Sell Faster, Earn Bigger Profits, Satisfy More Customers

Here Are Two of the Many Star Performers in Qualitone's Complete Line:

#### ULTRA-MINIATURE

The Smallest Earpiece in the World

- 1/16" (1.6mm) diameter
- Available in 10 different colors
- 1/16" (1.6mm) diameter
- 1/16" (1.6mm) diameter
- 1/16" (1.6mm) diameter
- 1/16" (1.6mm) diameter
- 1/16" (1.6mm) diameter
- 1/16" (1.6mm) diameter

#### SUB-MINIATURE

1/8" (3.2mm) diameter

- 1/8" (3.2mm) diameter
- 1/8" (3.2mm) diameter
- 1/8" (3.2mm) diameter
- 1/8" (3.2mm) diameter
- 1/8" (3.2mm) diameter
- 1/8" (3.2mm) diameter
- 1/8" (3.2mm) diameter
- 1/8" (3.2mm) diameter

Qualitone Instruments are available in 10 different colors. Qualitone Instruments are available in 10 different colors. Qualitone Instruments are available in 10 different colors.

Get in on

now avail

IN

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

Notes

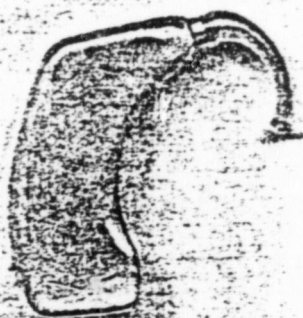
Notes

Notes

Notes

Notes

Notes



903





vanco hearing aids, inc. • p.o. box 1289 • telephone 446-7795 • clearwater, florida

Dear Hearing Aid Distributor:

20 million people in the United States have deficient hearing. Half of these or 10 million, have losses which warrant the use of a hearing aid. In spite of this fantastic market, the industry sold a mere 344,000 new units in 1962. This is a loss of over 2,000 aids per month compared to 1961 and a loss of over 4,000 aids per month compared to 1960. Great technical advances have been made. Much has been done to popularize hearing aids. Medical science has lengthened our life span and the future will see a greatly expanded potential market. Everything points to the industry selling many more units, but the sales decline... The road-block is "price".

More people refuse to buy because of price than for all other reasons combined. The simple truth is our industry has worked from the beginning to justify high price. Continuing to talk about the high cost of tooling, engineering, research, selling, advertising and servicing will not make the public believe it. We will not reverse the present sales trend and make a significant break-through saleswise until we can start selling people hearing aids at prices they are willing to pay.

Our industry had its greatest hour when the average retail price was about \$200.00. We have gone too far with price. We face a dim future unless we return to a price level acceptable to the public. Everyone agrees you must operate with a high profit margin and that you could not afford to reduce prices by lowering your profit ratio. However, if you could expose yourself to the vast market presently opposed to high prices, and do this with an improved profit ratio, your profits would increase and the unit sales would quickly reverse the present sales trend. You can do this with VANCO...

Whenever the word "price" is mentioned, the word "quality" is not far behind. Quality is the most overworked sales word in the industry and it has become a state of mind rather than an indication of value. May I suggest a thought for your serious consideration? Now, in the silicon transistor era, a particular group of components is required to make a good hearing aid. Every company making a good aid buys the same group of parts and buys them from the same suppliers. When two aids are compared, both containing the same components, how can one be a quality aid and the other not? We buy nothing but the best grade of components and you can be sure those parts do not work one bit better when used in brand "X", "Y" or "Z".

This is the time to take quality for granted because all good companies use quality materials and start selling the public something they will buy -- "value".

HEARING AID MUSEUM & ARCHIVES  
KENT STATE UNIVERSITY  
KENT, OHIO 44242

Sincerely,

VANCO Hearing Aids, Inc.

*G. A. Van Schenck, Jr.*  
G. A. Van Schenck, Jr.  
President

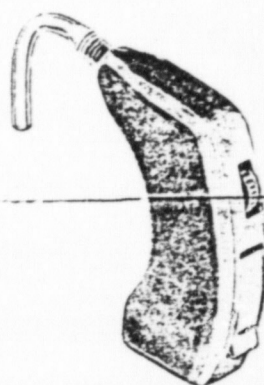
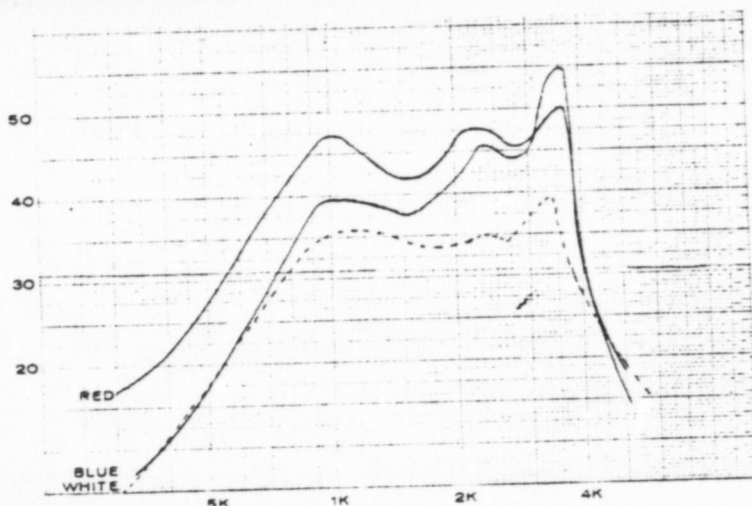
REG. U.S. PAT. OFF.

904



# VANCO

## Proudly Announces The New MINI-EAR®



Using the New **NPN SILICON PLANAR** Transistors for More Power – More Clarity – Better Temperature Control.

And the New **SILVER OXIDE** Battery with Greater Power (a Full 1.5 volts) for Better Hearing.

NO BATTERY NOISE — TROUBLE FREE SERVICE — ALL WEATHER USE — LONG SERVICE AND SHELF LIFE.

**TRANSISTORS:** 3 NPN SILICON PLANAR  
(High Beta)

**BATTERY:** S-76E (Silver Oxide)

**BATTERY LIFE:** 85-90 HOURS

**COLOR:** BEIGE

WITH A CHOICE OF THREE DIFFERENT CIRCUITS

**RED DOT:** STANDARD; **BLUE DOT:** NERVE; **WHITE DOT:** MILD

**PEAK GAIN:** 54 db

**AVERAGE GAIN:** 42 db (400 - 4,000 cps)

**SIMPLIFIED CHASSIS** ..

No "Gadgets" to cause trouble.

ONE YEAR GUARANTEE WITH 6 MONTHS NEW INSTRUMENT REPLACEMENT.

# QUALITY + VALUE = VANCO

905

## "MINI-EAR" DISTRIBUTOR PRICE

SINGLE  
UNIT  
\$51.00

THREE  
UNITS  
\$48.50 ea.

FIVE  
UNITS  
\$46.00 ea.

SUGGESTED LIST PRICE: \$200.00

TERMS: Net Cash with order

Shipping charges prepaid.

HOW  
MUCH  
**VALUE**  
ARE YOU  
SELLING?

During the first half of 1963 industry sales were less than 3 units per person per month.

Hundreds of dealers have told us they could sell more aids at lower prices, but refuse to do so because they do not make enough money.

This is why we are introducing the "MINI-EAR". The lower wholesale price permits you to increase your sales, retaining the adequate mark-up you need for a profitable operation.

**STOP**  
MISSING THOSE  
**SALES**  
EACH MONTH!

Remember, the "MINI-EAR" is **not** made as a "price" instrument. It incorporates the latest electronic achievements made possible by the silicon transistor and the silver oxide battery. It is a product second to none and offers more "VALUE" to you and your customer than ever before.

IT WON'T COST YOU A CENT TO TRY THE "MINI-EAR". YOU'LL BE MIGHTY GLAD YOU DID . . .

All replies confidential

PROTECTED TERRITORIES  
AVAILABLE TO  
QUALIFIED DISTRIBUTORS

VANCO HEARING AIDS, INC.  
P. O. Box 1289  
Clearwater, Florida

Yes, I'd like to try the new VANCO "MINI-EAR".

I understand I may return this initial order for refund within 15 days if I am not completely satisfied.

NAME \_\_\_\_\_

STREET ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_

Ship me \_\_\_\_\_ "MINI-EAR" Check enclosed \_\_\_\_\_

906



**VANCO**

## MINI-EAR

### FEATURES

LOWEST PRICE  
STURDY CASE DESIGN  
ECONOMICAL OPERATION  
MODERATE GAIN



The MINI-EAR is VANCO's lowest priced hearing aid designed for those who cannot afford a smaller and more elaborate instrument. The MINI-EAR has moderate gain and very sturdy design.

### SPECIFICATIONS

Gain .....38 db  
Output .....112 db  
Frequency Range ..... 400 to 3800 Hz  
Battery & Life ..... 675 - 150 hours  
Circuit ..... 3 Silicon Transistor  
Response ..... Standard Harvard Curve

(Response on Back)

VANCO INDUSTRIES, INC.

1955 SHERWOOD STREET

PHONE (813) 446-8392

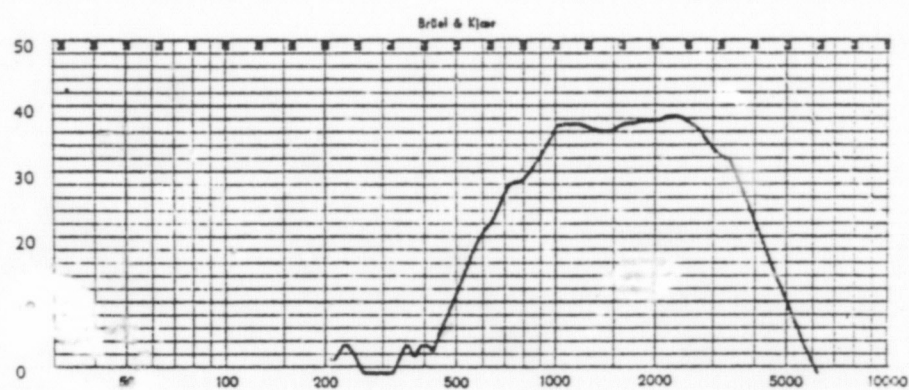
POST OFFICE BOX Q

CLEARWATER, FLORIDA 33514

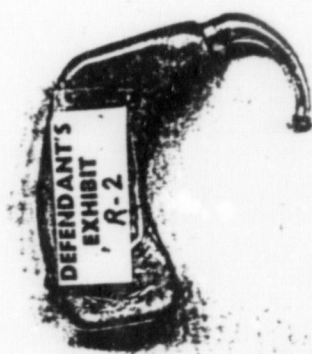
907



# Frequency Response Curve of MINI-EAR



908



EX. R-2

(909)



EX. R-2

910



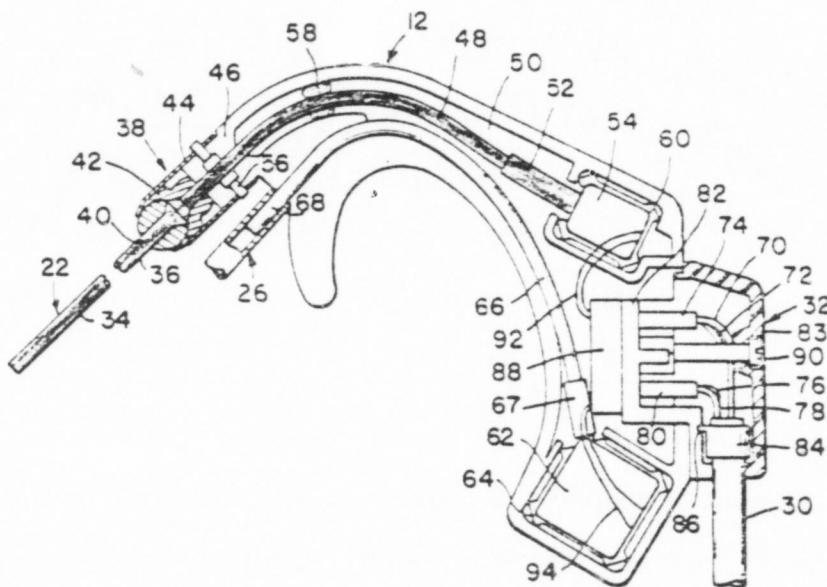
[72] Inventor Kenneth J. Hutchings  
Soquel, Calif.  
[21] Appl. No. 17,220  
[22] Filed Mar. 6, 1970  
[45] Patented Oct. 5, 1971  
[73] Assignee Pacific Plantronics, Inc.  
Santa Cruz, Calif.  
Continuation-in-part of application Ser. No. 839,016, July 3, 1969, now Patent No. 3,548,118.

[56] References Cited  
UNITED STATES PATENTS  
3,440,365 4/1969 Bryant et al. 179/156  
3,280,273 10/1966 Flygstad et al. 179/156  
Primary Examiner—William C. Cooper  
Attorney—Flehr, Hohbach, Test, Albritton & Herbert

[54] SELF-SUPPORTING HEADSET  
4 Claims, 3 Drawing Figs.

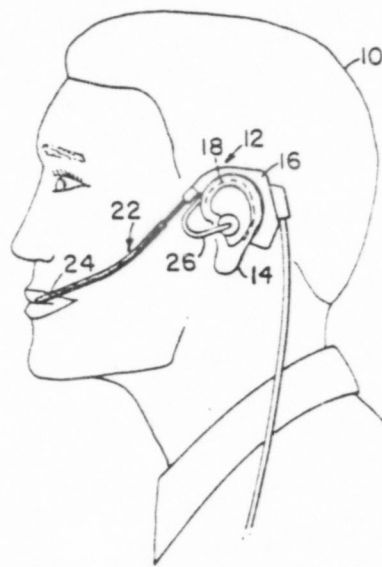
[52] U.S. Cl. 179/156  
[51] Int. Cl. H04m 1/05  
[50] Field of Search 179/156

**ABSTRACT:** A self-supporting headset is disclosed with a housing adapted to accommodate a receiver and microphone. The headset housing comfortably supports itself on the upper portion of an ear of the user. A flexible acoustic tube together with an adjustable voice tube are mounted on an upper portion of the housing forward of the user's ear. The acoustic tube curves backwardly to provide communication between the auditory canal of the user's ear and the receiver through a tube along the inner periphery of the housing. The voice tube provides communication between the user's mouth and the microphone. Electrical signals are carried to and from the microphone and receiver through a pin and socket connection together with a strain relief collar device mounting a lead wire cable to the housing.

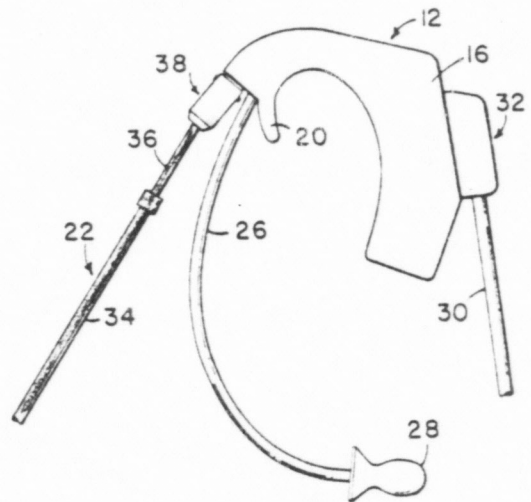


Ex. S

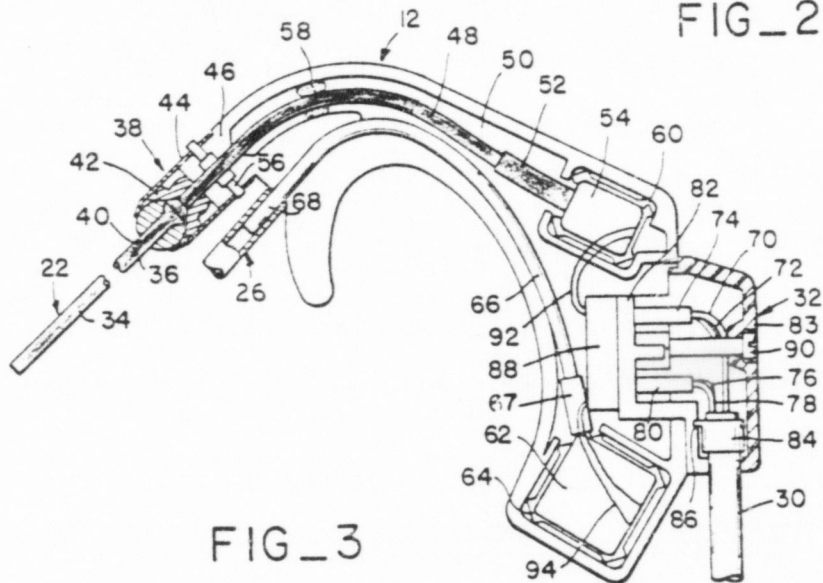
911



FIG\_1



FIG\_2



FIG\_3

INVENTOR

KENNETH J. HUTCHINGS

BY

*Felsh, Hohbach, Test  
Albritton & Herbert*  
ATTORNEYS

912

## SELF-SUPPORTING HEADSET

## CROSS-REFERENCE TO RELATED APPLICATION

This is a continuation-in-part of my copending application Ser. No. 839,016, filed July 3, 1969, now U.S. Pat. No. 3,548,118.

## BACKGROUND OF THE INVENTION

This invention relates generally to headsets and more particularly to headsets which contain a microphone and receiver and are adapted to be supported solely from the ear of the user.

Conventional headsets have included various intermediate supporting structures mounting the headset in cooperative relationship with the ear and mouth of the user. These supporting structures have included headbands and means for attaching the headset to portions of eyeglasses, but this has resulted in a cumbersome arrangement. Ear molds have also been used for supporting the headset from inside the ear, but this necessitates fitting of the ear mold to the individual users.

## SUMMARY OF THE INVENTION AND OBJECTS

It is a general object of the present invention to provide a lightweight headset which can be comfortably and securely worn by telephone operators, radio operators, aircraft personnel, or other persons using communication systems.

Another object is to provide a headset which may be easily fitted on the user's ear, is balanced to rest comfortably on the ear without the necessity of a supporting headband or the like, and which provides complete working mobility for the user, in performing other duties.

Another object is to provide a headset for wearing on the ear of a user in which an improved socket arrangement is provided for connecting the electrical cable to the microphone and receiver outlets in the headset.

In general, the foregoing and other objects of the invention are achieved by a headset which comprises a housing shaped and balanced for comfortable wearing on the ear of the user. An extensible voice tube mounted on an upper forward end of the housing has a distal end adapted to be placed adjacent the mouth of the user for transmitting sound to the microphone. A flexible acoustic tube is mounted to the housing adjacent the voice tube and provides communication between the auditory canal of the ear and the receiver through a tube running along the inner periphery of the housing. The output leads from the microphone and receiver transducers connect with an electrical cable through a pin and socket arrangement. The cable is mounted on the housing by means of a strain relief collar providing an opening through a cover over the socket connection.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates the self-supporting headset of the present invention in position upon a user's ear;

FIG. 2 is an enlarged side elevational view of the headset; and,

FIG. 3 is an enlarged view of the headset with one side of the housing removed to show the internal elements thereof.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIG. 1, a user 10 is shown with a headset 12 according to the present invention mounted behind his ear 14. The headset includes a housing 16 defining a curved, inner periphery 18 adapted to fit comfortably over and behind the user's ear. As illustrated in FIG. 2, the housing includes a horn or projection 20 which extends over and engages the top of the ear to hold the housing in place.

An extensible voice tube 22 is mounted in the forward end of the housing 16 and extends downwardly and forwardly with its distal end 24 adjacent the user's mouth to receive voice communication therefrom. A flexible acoustic tube 26 is mounted on the forward end of the housing adjacent to and

below the mounting connection for voice tube 22. An ear insert 28 mounted on the distal end of tube 26 is adapted to be inserted into the user's ear. Acoustic tube 26 provides communication between the auditory canal of the user's ear and the receiver transducer within the housing. An electrical cable 30 is mounted to the rear of the headset through cover assembly 32 and depends downwardly therefrom.

Referring to FIGS. 2 and 3, the headset 12 is illustrated in greater detail. Extensible voice tube 22 includes lower portion 34 telescoping with upper portion 36 so that the tube may be extended or retracted to adjust the position of distal end 24 with respect to the user's mouth. Tube 22 is supported from housing 12 by a ball and socket joint 38 adapted to pivotally adjust the angular relationship of the tube with respect to the housing. This joint 38 comprises a ball 40 fitting over the end of tube portion 36. The ball is mounted in socket 42 by means of a ferrule 44 mounted on a stub portion 46 of the housing. Socket 42 communicates with a tube 48 extending through a housing cavity 50 to a flexible tube 52 which in turn is connected with microphone transducer 54. Housing cavity 50 is formed between two mating housing parts one of which is shown in FIG. 3, secured together by suitable means such as pins or sonic bonding. Ferrule 44 detachably secures voice tube 22 to the housing 12 through slots in the sides of the ferrule which releasably engage a pair of pins 56 mounted in and extending radially from stub portion 46. Flexible tube 52 functions to isolate microphone 54 from any motion of housing 12. Tube 48 is held in the housing by epoxy material 58 with the two housing parts assembled together. Microphone transducer 54 is supported within the housing by a resilient boot 60 adapted to isolate the transducer from vibrations of the housing to protect the transducer from the effects of shock, and to decouple the microphone from receiver 62.

Flexible acoustic tube 26 is mounted to the upper, forward end of the housing adjacent to and below ball and socket connection 38. This mounting arrangement provides improved balancing features so that the headset is more comfortably worn by the user. Thus, the weight of both acoustic tube 26 and voice tube 22 provides a torque to balance the weight of the housing elements and cable 30 behind the ear. At the same time, acoustic tube 26 curves forwardly and then rearwardly for insertion in the user's ear so as not to interfere or become entangled with the user's wearing apparel, e.g. earrings, and does not interfere with the user's freedom of motion.

Receiver transducer 62 is resiliently supported within the lower portion of the housing by a resilient boot 64. This boot functions to decouple the receiver from the microphone to protect it from the effects of shock, and to isolate it from vibrations. An internal tube 66 is connected at one end with receiver 62 through flexible tube 67 and is directed upwardly within cavity 50 along the inner periphery of the housing where it extends through the housing at downwardly inclined projecting tube 68. Flexible tube 26 is fitted over projection 68 and depends downwardly therefrom for insertion of ear insert 28 into the user's ear.

Cable 30 is secured to the housing by cover assembly 32 adapted to provide strain relief of the cable with respect to the housing. The microphone lead wires 70, 72 extend from the cable and are secured to a first pair of pins 74. The receiver lead wires 76, 78 extend from the cable and are secured to a second pair of pins 80. The four pins 74, 80 are inserted in and located by a support member 82 which together with base member 88 defines a socket assembly. A cover 83 is secured over the socket assembly to retain strain relief collar 84 in place. A projection 86 on collar 84 is anchored in the material of support 82, and cable 30 is mounted through collar 84 thereby providing firm support for the cable end as the cable 70 flexes. The cover assembly is retained in position by a screw 90 engaging a nut, not shown, in the base member. Leads 92 are connected between pins 74 and microphone 54, while leads 94 are connected between pins 80 and receiver 62.

Referring now to FIGS. 1 and 2, it is seen that the headset is self-supporting on the operator or user's ear. The headset fits

913



3,610,841

3

4

behind the ear with the projection 20 extending over and engaging the top of the ear. Both the telescoped voice tube 22 and flexible acoustic tube 26 are mounted to the forward end of housing 12. The weight of voice tube 22 provides a counter-clockwise torque to the housing tending to counterbalance the weight of the rear housing portion and cable 30. Acoustic tube 22 curves forwardly and downwardly to the ear where it does not interfere with the user's wearing apparel for freedom of movement. The acoustic tube is connected with a receiver within the housing by means of a tube extending along the inner periphery of a cavity in the housing. Cable 30 is mounted to the rear of the housing by a cover assembly in a manner providing convenient and rapid assembly and disassembly, while at the same time providing strain relief of the cable end with respect to the housing.

I claim:

1. A headset comprising: a housing adapted to be placed behind the ear of the user, the housing including a forwardly extending end projecting over the top of the user's ear, the housing defining an internal cavity; a microphone mounted within the cavity near the top of said housing; a forwardly extending voice tube mounted on the forward end of the housing, the voice tube having an upper portion communicating with said microphone, and a lower extensible portion pivotally connected with the upper portion and adapted to have its distal end positioned adjacent the user's mouth; a receiver disposed in the cavity near the bottom of the housing; a flexible ac-

oustic tube mounted to the forward end of the housing adjacent the connection thereof with the voice tube, the acoustic tube having an internal tube segment mounted along the inner periphery of the housing cavity and in communication with the receiver, and an external tube segment projecting from the housing and adapted to communicate with the auditory canal of the user's ear.

2. A headset as in claim 1 and further characterized in that the internal tube segment of the acoustic tube includes a projecting tube end extending from the housing forward end adjacent to and below the connection of the extensible voice tube with the housing, and the external tube segment of the acoustic tube is connected with said projecting tube end.

3. A headset as in claim 1 and including an electrical cable; 15 socket means for connecting said cable in electrical communication with the receiver and microphone within the housing; and, a cover assembly to mount the cable to the rear of the housing, the cover assembly including strain relief means to securely hold the cable end with respect to the housing and cover assembly.

4. The invention of claim 3 and further characterized in that the socket means includes a support member, the strain relief means includes a collar adapted to grip the cable end and having a projection embedded in the socket support, and fastener means to lock the cover assembly to the housing for holding the strain relief collar and cable to the socket support.

30

35

40

45

50

55

60

65

70

75

913

20 (Series of 1970)		P. R. Group		PATENT NUMBER 3610841	
Assist. Examiner		Class 179		DATED OCT 6 1974	
Group		Subclass 56		A. Claims Priority Foreign Application (s) Yes <input type="checkbox"/> No <input type="checkbox"/>	
23		Filed complete (Date) 03-06-70		B. Meets conditions specified in 35 USC 119 Yes <input type="checkbox"/> No <input type="checkbox"/>	
		Serial No. 17 220		If "Yes" checked in A and B, complete C, D, E, and F.	
				C. Country	
				D. Application Date	
				E. Application No.	
				F. Patent No.	
				Number claims allowed	
				Printed name	
				Class	
				Subclass	
				179	
				56	
S, KENNETH J., Calif., <i>Radio Electronics Inc., Santa Cruz, Calif.</i>					
PORTING HEADSET					
DIVISION OF: FILED CONTINUATION OF: S. No. GRANTED S. No.					
PAT. NO. CONTINUATION OF: FILED S. No.					
SUBSTITUTE FOR: FILED S. No.					
S. No.					
NONE					
Ind. claims		Filing fee rec.		Transaction	
1		\$65		A25597	

This is to certify that annexed hereto is a true copy from the records of the United States Patent Office of File Wrapper and Contents of the file identified above.

By authority of the  
COMMISSIONER OF PATENTS

*W. L. Country*  
Certifying Officer

Date

OCT 7 1974

Ex. 1

915

17220

SERIAL NO. (Series of 1970)

PATENT  
NUMBER

3610841

Assistant examiner

Class

Subclass

DATED

OCT 5 1971

Group No.

Filed complete (Date)

Serial No.

A. Claims Priority Foreign Application (s) Yes ☐B. Meets conditions specified in 35 USC 119 Yes ☐

If "Yes" checked in A and B, complete C, D, E, and F.

C. Country

D. Application Date

E. Application No.

F. Patent No.

Applicant(s)

HUTCHINGS, KENNETH J.,  
SOQUEL, Calif.,Number claims  
allowed

Print claims

Class

Subclass

4 *approx* 179 156

Assignor(s) to

*Tri-Phonics Electronics Inc., Santa Cruz,  
Calif., a Corp. of California.*

Title of invention

SELF-SUPPORTING HEADSET

☐ DIVISION OF:

FILED

CONTINUATION

S. N.

GRANTED

S. N.

PAT. NO.

☐ CONTINUATION OF:

FILED

FILED

S. N.

☐ SUBSTITUTE FOR:

FILED

NONE

S. N.

☒ NONE

Sh. drw.

Total claims

Ind. claims

Filing fee rec.

Transaction

Atty's docket

1

4

1

\$65

A-25597

A25597

Send correspondence to:

FLEHR, HOHBACH, TEST, ALBRITTON

AND HERBERT

15TH FL. HONGKONG BANK BLDG.

SAN FRANCISCO, CA. 94104

Principal attorney(s)

FLEHR, HOHBACH, TEST, ALBRITTON AND HERBERT

Associate attorney(s)

PARTS OF APPLICATION FILED SEPARATELY

PREPARED FOR ISSUE

(Assistant Examiner)

(Docket Clerk)

EXAMINED AND PASSED FOR ISSUE

WILLIAM C. COOPER

(Primary Examiner)

(Att unit)

V

[ THIS SPACE RESERVED  
FOR RETENTION LABEL ][ THIS SPACE  
RESERVED ]

Number of printed pages

Issue fee due

Drawing(s)

Spec(s)

Notice of allowance and issue fee due ( )

Date mailed

APR 13 197

916

22





## IN THE UNITED STATES PATENT OFFICE

17220

Date March 3, 1970

File A- 25597

The Commissioner of Patents  
Washington, D. C. 20231

Sir:

Transmitted herewith for filing is the patent application of Inventor(s): KENNETH J. HUTCHINGS

For: SELF-SUPPORTING HEADSET

Enclosed are also:

- ☒ 1 sheets of drawing.
- ☒ An assignment of the invention to PACIFIC PLANTRONICS, INC. The cost of recording to be charged to Account No. 06-1300 (Account No. A-25597 ).
- ☐ A certified copy of a application. Priority is claimed under 35 U.S.C. 119.
- ☐ A preliminary search has disclosed the prior art set forth in attached Exhibit I.

Claims as filed

For	Number filed	Number extra	Rate	Basic fee \$65.00
Total claims	4 - 10 =	0 x	\$2	= - 0 -
Independent claims	1 - 1 =	0 x	\$10	= - 0 -
Total filing fee			\$ 65.00	

- ☒ Our check No. 5662 in the amount of \$ 65.00 to cover the filing fee is enclosed.
- ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any over-payment to Account No. 06-1300. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

FLEHR, HOHBACH, TEST,  
ALBRITTON & HERBERT

By

  
Aldo J. Test

Telephone: (415) 781-1989

917

23



MAR 6



-5597

101  
17220

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN that I, KENNETH J. HUTCHINGS, a citizen  
the United States of America, residing in the City of Soquel,  
County of Santa Cruz, State of California, have invented  
5 certain new and useful improvements in a

## SELF-SUPPORTING HEADSET

Abstract of the Disclosure

A self-supporting headset is disclosed with a housing  
adapted to accommodate a receiver and microphone. The headset  
10 housing comfortably supports itself on the upper portion of an  
ear of the user. A flexible accoustic tube together with an  
adjustable voice tube are mounted on an upper portion of the  
housing forward of the user's ear. The accoustic tube curves  
backwardly to provide communication between the auditory canal  
15 of the user's ear and the receiver through a tube along the  
inner periphery of the housing. The voice tube provides communi-  
cation between the user's mouth and the microphone. Electrical  
signals are carried to and from the microphone and receiver  
through a pin and socket connection together with a strain  
20 relief collar device mounting a lead wire cable to the housing

Cross-Reference to Related Application

*B*  
*A* This is a continuation-in-part of  
~~A Reference is made to~~ my co-pending application Serial  
No. 839,016, filed July 3, 1969, now U.S. Patent No. 3,548,111

918

### Background of the Invention

This invention relates generally to headsets and more particularly to headsets which contain a microphone and receiver and are adapted to be supported solely from the ear of the user.

5           Conventional headsets have included various intermediate supporting structures mounting the headset in cooperative relationship with the ear and mouth of the user. These supporting structures have included headbands and means for attaching the headset to portions of eyeglasses, but this has resulted in a cumbersome  
10 arrangement. Ear molds have also been used for supporting the headset from inside the ear, but this necessitates fitting of the ear mold to the individual users.

### Summary of the Invention and Objects

15           It is a general object of the present invention to provide a light-weight headset which can be comfortably and securely worn by telephone operators, radio operators, aircraft personnel, or other persons using communication systems.

20           Another object is to provide a headset which may be easily fitted on the user's ear, is balanced to rest comfortably on the ear without the necessity of a supporting headband or the like, and which provides complete working mobility for the user, in performing other duties.

25           Another object is to provide a headset for wearing on the ear of a user in which an improved socket arrangement is provided for connecting the electrical cable to the microphone and receiver outlets in the headset.



In general, the foregoing and other objects of the invention are achieved by a headset which comprises a housing shaped and balanced for comfortable wearing on the ear of the user. An extensible voice tube mounted on an upper forward end of the housing has a distal end adapted to be placed adjacent the mouth of the user for transmitting sound to the microphone. A flexible accoustic tube is mounted to the housing adjacent the voice tube and provides communication between the auditory canal of the ear and the receiver through a tube running along the inner periphery of the housing. The output leads from the microphone and receiver transducers connect with an electrical cable through a pin and socket arrangement. The cable is mounted on the housing by means of a strain relief collar providing an opening through a cover over the socket connection.

#### Brief Description of the Drawings

Figure 1 illustrates the self-supporting headset of the present invention in position upon a user's ear;

Figure 2 is an enlarged side elevational view of the headset; and,

Figure 3 is an enlarged view of the headset with one side of the housing removed to show the internal elements thereof.

#### Description of the Preferred Embodiments

Referring now to Figure 1, a user 10 is shown with a headset 12 according to the present invention mounted behind his ear 14. The headset includes a housing 16 defining a curved

inner periphery 18 adapted to fit comfortably over and behind the user's ear. As illustrated in Figure 2, the housing includes a horn or projection 20 which extends over and engages the top of the ear to hold the housing in place.

5           An extensible voice tube 22 is mounted in the forward end of housing 16 and extends downwardly and forwardly with its distal end 24 adjacent the user's mouth to receive voice communication therefrom. A flexible acoustic tube 26 is mounted on the forward end of the housing adjacent to and below the  
10           mounting connection for voice tube 22. An ear insert 28 mounted on the distal end of tube 26 is adapted to be inserted into the user's ear. Acoustic tube 26 provides communication between the auditory canal of the user's ear and the receiver transducer within the housing. An electrical cable 30 is mounted to the  
15           rear of the headset through cover assembly 32 and depends downwardly therefrom.

          Referring to Figures 2 and 3, the headset 12 is illustrated in greater detail. Extensible voice tube 22 includes lower portion 34 telescoping with upper portion 36 so that  
20           the tube may be extended or retracted to adjust the position of distal end 24 with respect to the user's mouth. Tube 22 is supported from housing 12 by a ball and socket joint 38 adapted to pivotally adjust the angular relationship of the tube with respect to the housing. This joint 38 comprises a ball 40 fitting  
25           over the end of tube portion 36. The ball is mounted in socket 42 by means of a ferrule 44 mounted on a stub portion 46 of the housing. Socket 42 communicates with a tube 48 extending



through a housing cavity 50 to a flexible tube 52 which in turn  
is connected with microphone transducer 54. Housing cavity 50  
is formed between two mating housing parts, one of which is  
shown in Figure 3, secured together by suitable means such as  
pins or sonic bonding. Ferrule 44 detachably secures voice tube  
22 to the housing 12 through slots in the sides of the ferrule  
which releasably engage a pair of pins 56 mounted in and extending  
radially from stub portion 46. Flexible tube 52 functions to  
isolate microphone 54 from any motion of housing 12. Tube 48  
is held in the housing by epoxy material 58 with the two housing  
parts assembled together. Microphone transducer 54 is supported  
within the housing by a resilient boot 60 adapted to isolate  
the transducer from vibrations of the housing to protect the  
transducer from the effects of shock, and to decouple the micro-  
phone from receiver 62.

Flexible accoustic tube 26 is mounted to the upper  
forward end of the housing adjacent to and below ball and socket  
connection 38. This mounting arrangement provides improved  
balancing features so that the headset is more comfortably worn  
by the user. Thus, the weight of both accoustic tube 26 and  
voice tube 22 provides a torque to balance the weight of the  
housing elements and cable 30 behind the ear. At the same time  
accoustic tube 26 curves forwardly and then rearwardly for  
insertion in the user's ear so as not to interfere or become  
entangled with the user's wearing apparel, e.g. earrings, and  
does not interfere with the user's freedom of motion.

922



Receiver transducer 62 is resiliently supported within the lower portion of the housing by a resilient boot 64. This boot functions to decouple the receiver from the microphone, to protect it from the effects of shock, and to isolate it from vibrations. An internal tube 66 is connected at one end with receiver 62 through flexible tube 67 and is directed upwardly within cavity 50 along the inner periphery of the housing where it extends through the housing at downwardly inclined projecting tube end 68. Flexible tube 26 is fitted over projection 68 and depends downwardly therefrom for insertion of ear insert 28 into the user's ear.

Cable 30 is secured to the housing by cover assembly 32 adapted to provide strain relief of the cable with respect to the housing. The microphone lead wires 70,72 extend from the cable and are secured to a first pair of pins 74. The receiver lead wires 76,78 extend from the cable and are secured to a second pair of pins 80. The four pins 74,80 are inserted in and located by a support member 82 which together with base member 88 defines a socket assembly. A cover 82 is secured over the socket assembly to retain strain relief collar 84 in place. A projection 86 on collar 84 is anchored in the material of support 82, and cable 30 is mounted through collar 84 thereby providing firm support for the cable end as the cable flexes. The cover assembly is retained in position by a screw 90 engaging a nut, not shown, in the base member. Leads 92 are connected between pins 74 and microphone 54, while leads 94 are connected between pins 80 and receiver 62.

Referring now to Figures 1 and 2, it is seen that the headset is self-supporting on the operator or user's ear. The headset fits behind the ear with the projection 20 extending over and engaging the top of the ear. Both the telescoped voice tube 22 and flexible accoustic tube 26 are mounted to the forward end of housing 12. The weight of voice tube 22 provides a counter-clockwise torque to the housing tending to counterbalance the weight of the rear housing portion and cable 30. Accoustic tube 22 curves forwardly and downwardly to the ear where it does not interfere with the user's wearing apparel or freedom of movement. The accoustic tube is connected with a receiver within the housing by means of a tube extending along the inner periphery of a cavity in the housing. Cable 30 is mounted to the rear of the housing by a cover assembly in a manner providing convenient and rapid assembly and disassembly, while at the same time providing strain relief of the cable end with respect to the housing.

### CLAIMS

1. A headset comprising: a housing adapted to be placed behind the ear of the user, the housing including a forwardly extending end projecting over the top of the user's ear, the housing defining an internal cavity; a microphone mounted within the cavity near the top of said housing; a forwardly extending voice tube mounted on the forward end of the housing, the voice tube having an upper portion communicating with said microphone, and a lower extensible portion pivotally connected with the upper portion and adapted to have its distal end positioned adjacent the user's mouth; a receiver disposed in the cavity near the bottom of the housing; a flexible accoustic tube mounted to the forward end of the housing adjacent the connection thereof with the voice tube, the accoustic tube having an internal tube segment mounted along the inner periphery of the housing cavity and in communication with the receiver, and an external tube segment projecting from the housing and adapted to communicate with the auditory canal of the user's ear.

2. A headset as in Claim 1 and further characterized in that the internal tube segment of the accoustic tube includes a projecting tube end extending from the housing forward end adjacent to and below the connection of the extensible voice tube with the housing, and the external tube segment of the accoustic tube is connected with said projecting tube end.

925

11



3. A headset as in Claim 1 and including an electrical cable; socket means for connecting said cable in electrical communication with the receiver and microphone within the housing; and, a cover assembly to mount the cable to the rear of the housing, the cover assembly including strain relief means to securely hold the cable end with respect to the housing and cover assembly.

4. The invention of Claim 3 and further characterized in that the socket means includes a support member, the strain relief means includes a collar adapted to grip the cable end and having a projection embedded in the socket support, and fastener means to lock the cover assembly to the housing for holding the strain relief collar and cable to the socket support.

IN THE UNITED STATES PATENT OFFICED E C L A R A T I O N

KENNETH J. HUTCHINGS the above-named petitioner, declares that he is a citizen of the United States and resident of the City of Soquel, County of Santa Cruz, State of California, that he verily believes himself to be the original, first and sole inventor of the improvement in a SELF-SUPPORTING HEADSET described and claimed in the foregoing specification; that this application in part discloses and claims only subject matter disclosed in his earlier filed pending application, Serial No. 839,016, filed July 3, 1969; that, as to the subject matter of this application which is common to said earlier application, he does not know and does not believe that the same was ever known or used in the United States before his invention thereof or patented or described in any printed publication in any country before his invention thereof or more than one year prior to said earlier application, or in public use or on sale in the United States more than one year prior to said earlier application; that said common subject matter has not been patented before the date of said earlier application in any country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to said application; and that no application for patent on said invention has been filed by him or his representatives or assigns in any country foreign to the United States that, as to the subject matter of this application which is not common to said earlier application he does not know and does not believe that the same was ever known or used in the United States before his invention thereof

927

13

or patented or described in any printed publication in any country before his invention thereof or more than one year prior to the date of this application, or in public use or on sale in the United States more than one year prior to the date of this application, and that said subject matter has not been patented in any country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to the date of this application; and that no application for patent on said invention has been filed by him or his representatives or assigns in any country foreign to the United States.

And I hereby appoint FLEHR, HOHBACH, TEST, ALBRITTON  
& HERBERT, 15th Floor, Hongkong Bank Building, 160 Sansome Street,  
San Francisco, California 94104, Telephone: (415) 781-1989,  
Registration No. 15,929, my attorneys to prosecute this application and to transact all business in the Patent Office connected therewith.

Wherefore I pray that Letters Patent be granted to me for the invention or discovery described and claimed in the foregoing specification and claims, and I hereby subscribe my name to the foregoing specification and claims, declaration, power of attorney, and this petition.

The undersigned petitioner declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that



such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Inventor's full name Kenneth J. Hutchings  
Kenneth J. Hutchings

Date: February 19 - 1970

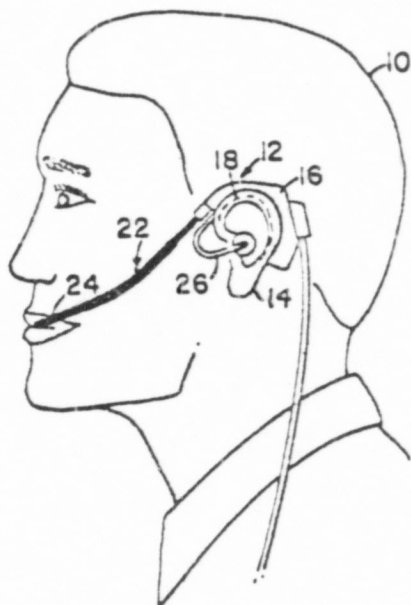
Post Office Address: 111 Josephine Street  
Santa Cruz CA 95060

PRINT OF DRAWING AS  
ORIGINALLY FILED

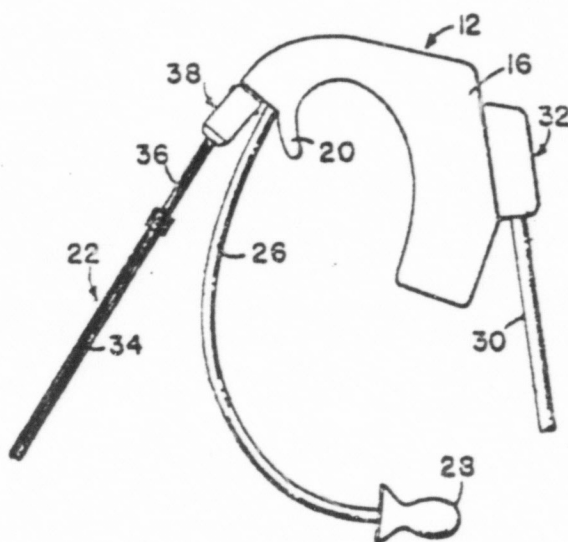
179/1560

17220

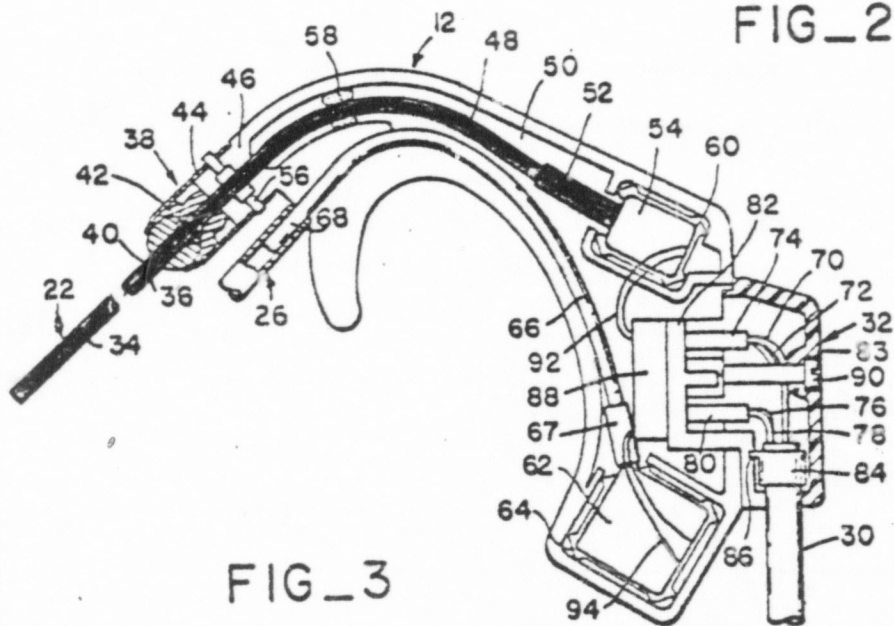
O.G. FIG.  
CLASS  
SUB-CLASS



FIG\_1



FIG\_2



FIG\_3

INVENTOR

KENNETH J. HUTCHINGS

BY

*Forster, Hohbach, Tost  
Allbritton & Herbert*  
ATTORNEYS

930 16



U.S. DEPARTMENT OF COMMERCE  
Patent Office

Address Only: COMMISSIONER OF PATENTS  
Washington, D.C. 20231

In Reply Please Refer To The Following:		
EXAMINER'S NAME	W C Cooper	
232	03-06-70	17 220
GR. ART UN.	FILING DATE	SERIAL NO.
HUTCHINGS, KENNETH J		
APPLICANT	INVENTION	
SELF-SUPPORTING HEADSET		

Paper No. 2/10

MAR 24 1971

Mailed

Flehr, Hohbach, Test, Albritton and  
Herbert  
15th Floor Hongkong Bank Bldg  
San Francisco, Calif 94104

Please find below a communication from the EXAMINER in charge of this application.

Commissioner of Patents

CHANGES AND/OR ADDITIONS TO THE APPLICATION RECORD MADE BY THE  
EXAMINER UPON ALLOWANCE

This application is in condition for allowance and the following changes have been made therein by the Examiner. Should the changes be unacceptable to applicant, an appropriate amendment may be proposed after the Notice of Allowance has been received, as provided under Rule 312. To ensure consideration of such an amendment, it must be submitted on or before remittance of the Base Issue Fee.

PROSECUTION ON THE MERITS IS CLOSED. A NOTICE OF ALLOWANCE WILL BE MAILED IN DUE COURSE.

- [X] Note attached Notice of References Cited, PO-892, which is part of this communication. The listed references are considered to be pertinent to the claimed invention, but the claims are deemed patentable thereover.

On page 1 at line 23 after "1969" the following has been inserted:  
-- , now U.S. Patent No. 3,548,118--

*William C. Cooper*

WILLIAM C. COOPER  
EXAMINER  
GROUP ART UNIT 232

Telephone (703) 557-2118

PLEASE FURNISH YOUR ZIP CODE IN ALL CORRESPONDENCE

931 17



TO SEPARATE FOLD TOP AND BOTTOM EDGES, SNAP-APART HARD CARBON

ATTACHMENT TO PAPER NO.

U.S. DEPARTMENT OF COMMERCE  
PATENT OFFICE

SERIAL NO.

17,220

GROUP ART UNIT

232

NOTICE OF REFERENCES CITED

Check here if this is a supplemental citation  
(do not prepare an additional folder)

APPLICANT(S)

HUTCHINGS

U.S. PATENTS

PATENT NO.	DATE	PATENTEE	CLASS	SUB-CLASS	FILING DATE APPROPRIATE
1 3 4 4 0 3 6 5	4/1969	Bryant et al	179	156	
2 3 2 8 0 2 7 3	10/1966	Flygstad et al	"	"	
3					
4					
5					
6					
7					
8					
9					
10					
11					

FOREIGN PATENTS AND SPECIFICATIONS \*

PATENT NO.	DATE	COUNTRY	NAME	CLASS	SUB-CLASS	PERTINENT SHTS. DWG.	P SP
1							
2							
3							
4							
5							
6							

OTHER REFERENCES (include author, title, date, pertinent pages, etc.)

MINER

W C Cooper

DATE

3-19-71

☐

Check here if foreign exchange

PUBLICATIONS

932

18

All communications regarding this application should give the serial number, date of filing and name of the applicant.



**U.S. DEPARTMENT OF COMMERCE  
Patent Office**

Address Only: COMMISSIONER OF PATENTS  
Washington, D.C. 20231

**NOTICE OF ALLOWANCE  
AND BASE ISSUE FEE DUE**

The application identified below has been examined and found allowable for issuance of Letters Patent.

FILING DATE 03/06/70	SERIAL NO. 017220	NO. OF CLAIMS ALLOWED 4	EXAMINER AND GROUP ART UNIT Cooper 232
APPLICANT(S) Hutchings, Kenneth J.; Soquel, Calif.			MAILED April 13, 1971
TITLE OF INVENTION (X indicates as amended by examiner) Self-supporting headset			
BASE FEE COMPUTATION		BASE FEE DUE	CLASS SUB
\$100.00	*\$2 (FOR DWG. @ \$2 PER SHEET) + \$10 (FOR FIRST PAGE PRINTED SPEC.)	0112	179/156.

The complete Issue Fee is one hundred dollars (\$100) plus two dollars (\$2) for each sheet of drawing, plus ten dollars (\$10) for each printed page of specification (including claims) or portion thereof.

Inasmuch as the final number of printed pages cannot be determined in advance of printing, an initial BASE ISSUE FEE (consisting of the fee for printing the first page of specification (\$10) plus the fee of (\$2) for each sheet of drawing, added to the fee of \$100) must be paid within three months from the date of this notice, or the application shall be regarded as ABANDONED.

When remitting said Base Issue Fee, enclosed Form POL-85b should be used, and if use of a Deposit Account is being authorized, POL-85c should also be forwarded.

The Base Issue Fee will not be accepted from anyone other than the applicant, his assignee, attorney, or a party in interest as shown by the records of the Patent Office.

If an assignment has not been previously filed and it is desired to have the patent issue to the assignee, the assignment must be received in this Office with the recording fee together with the Base Issue Fee. In any event, the appropriate space(s) under "Assignment Data" on POL-85b must be completed. Where there is an assignment, the assignee's address must be given to ensure its inclusion in the printed patent.

In connection with the address of the inventor(s), attention is directed to Form POL-231 enclosed.

A Notice of Balance of Issue Fee Due will be mailed together with the patentee's copy of the patent if an additional fee is due. Payment must be made within three months from the date shown on said Notice since FAILURE TO PAY THIS BALANCE WITHIN THE TIME SPECIFIED WILL RESULT IN LAPSE OF THE PATENT.

**IMPORTANT**

ATTENTION IS DIRECTED TO RULE 334  
REVISED NOVEMBER 4, 1969.

THE PATENT WILL ISSUE TO APPLICANT  
UNLESS AN ASSIGNEE IS SHOWN IN  
ITEM 2 ON FORM POL-85b, ATTACHED

Flehr, Hohbach, et al.  
15th Floor  
Hongkong Bank Bldg.  
San Francisco, Calif. 94104

**PATENT OFFICE COPY**

933



JUL 2 1971-15

BASE ISSUE FEE TRANSMITTAL

This form is provided in lieu of formal transmittal and should be used for transmitting the Base Issue Fee. Items 1 through 4 below should be completed as appropriate. The Base Issue Fee Receipt will be mailed to the address in item 4 or 2, depending on item 4a below.

1. The COMMISSIONER OF PATENTS is requested to apply the Base Issue Fee to the application identified below and deliver the patent as indicated.

FLEHR, HOMBACH, TEST, ALBRIT

JUNE 30, 1971

(DATE)

By: Aldo J. Test

(SIGNATURE OF PARTY IN INTEREST OF RECORD)

NOTE: The Base Issue Fee will not be accepted from anyone other than the applicant, his assignee, or attorney, or a party in interest as shown by the records of the Patent Office, nor will this fee be accepted in the application prior to the Notice of Allowance.

FILING DATE 03/06/70	SERIAL NO. 017220	NO. OF CLAIMS ALLOWED 4	EXAMINER AND GROUP ART UNIT Cooper 232
APPLICANT(S) Hutchings, Kenneth J., Sonoma, Calif.			MAILED April 13, 1971
TITLE OF INVENTION (X indicates as amended by examiner) Self-supporting headset			NOTICE OF ALLOWANCE DATE
BASE FEE COMPUTATION			CLASS-SUB
\$100.00	+\$2 (FOR DWG. @ \$2 PER SHEET)	+ \$10 (FOR FIRST PAGE PRINTED SPEC.)	179/156.
2. ASSIGNMENT DATA (print or type)			3. BASE FEE ENCLOSED
A. The appropriate box(es) in this item MUST be checked:			<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
(1) This application is NOT assigned:			Charge to my Deposit Account Number:
(2) <input checked="" type="checkbox"/> This application IS assigned:			(POL 85c must be enclosed)
(3) Assignment herewith:			a. <input type="checkbox"/> For Base Fee.
(4) <input checked="" type="checkbox"/> Assignment recorded and returned by Patent Office:			b. <input type="checkbox"/> For Balance of Issue Fee Due, if any.
<input type="checkbox"/> YES <input type="checkbox"/> NO			c. <input type="checkbox"/> For Recording Enclosed Assignment.
B. For printing on the patent: (Unless an assignee is identified below, the patent will issue to the applicant above-named. Completion of this item, however, is NOT a substitute for filing the assignment as required in Rule 334)			DO NOT USE THIS SPACE.
(1) NAME OF ASSIGNEE: PACIFIC PLANTRONICS, INC.			JUN-30-71 134592 A 106 - CK 100.00
(2) ADDRESS: (City & State or Country) SANTA CRUZ CA 95060			JUN-30-71 134593 A 107 - CK 10.00
(3) STATE OF INCORPORATION, IF ASSIGNEE IS A CORPORATION:			JUN-30-71 134594 A 108 - CK 2.00

MAILING INSTRUCTIONS

NOTE: All further correspondence, the patent together with the Notice of Balance of Issue Fee Due, if any, will be mailed to the addressee entered in the stub marked 4 at the lower left below, unless you direct otherwise by specifying the appropriate name and address in item 4a below right.

4a. Further correspondence is to be mailed to the following:

934





U.S. DEPARTMENT OF COMMERCE  
Patent Office

Address Only: COMMISSIONER OF PATENTS  
Washington, D.C. 20231

In Reply Please Refer To The Following:		
EXAMINER NAME K. Claffy		
232	03-06-70	17 220
GR. ART UN.	FILING DATE	SERIAL NO.
Kenneth J. Hutchings		
APPLICANT		INVENTION
SELF-SUPPORTING HEADSET		

Paper No. 3

AUG 26 1971

Mailed

[ Flehr, Hohbach, Test, Albritton  
and Herbert  
15th Floor, Hongkong Bank Bldg.  
San Francisco, Calif. 94104 ]

Please find below a communication from the EXAMINER in charge of this application.

Commissioner of Patents

CHANGES AND/OR ADDITIONS TO THE APPLICATION RECORD MADE BY THE  
EXAMINER UPON ALLOWANCE

This application is in condition for allowance and the following changes have been made therein by the Examiner. Should the changes be unacceptable to applicant, an appropriate amendment may be proposed after the Notice of Allowance has been received, as provided under Rule 312. To ensure consideration of such an amendment, it must be submitted on or before remittance of the Minimum Issue Fee.


PROSECUTION ON THE MERITS IS CLOSED. A NOTICE OF ALLOWANCE WILL BE MAILED IN DUE COURSE.

✓ Page 1, line 22, "Reference is made to" has  
been changed to "This is a continuation-in-part of"

K. Claffy:sm

Area Code 703  
557-2118

8-26-71

  
KATHLEEN H. CLAFFY  
EXAMINER  
GROUP ART UNIT 232

PLEASE FURNISH YOUR ZIP CODE IN ALL CORRESPONDENCE

935

17220

SERIAL NO. (Series of 1970)

Assistant examiner

COOP

Group No.

232

Applicant

# SEARCHED

Class	Sub	Date	Ex'r
179	156	MAR 19	W

INTERFERENCE SEARCHED			
Class	Sub	Date	Ex'r
179	156	MAR 19	W

## INDEX OF CLAIMS

Claim		Date	Claim		Date
Final	Original		Final	Original	
1	2	MAR 19	26		
2	3		27		
3	4		28		
4			29		
			30		
			31		
			32		
			33		
			34		
			35		
			36		
			37		
			38		
			39		
			40		
			41		
			42		
			43		
			44		
			45		
			46		
			47		
			48		
			49		
			50		

### SYMBOLS

### STATUS

- ✓ ..... Rejected
- ..... Allowed
- (Through numeral).... Canceled
- + ..... Restriction requirement
- N ..... Non-elected invention or amendment
- I ..... Interference
- ✓ ..... Appeal
- ..... Objected

936 22

LIKEU

8-6-70

# CONTENTS

LICENSING

1. Application ☒ papers.

2. EXAMINER AMENDMENT *1a*

MAR 24 1971

3. *Ers Antt*

AUG 26 1971

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

7. \_\_\_\_\_

8. \_\_\_\_\_

9. \_\_\_\_\_

10. \_\_\_\_\_

11. \_\_\_\_\_

12. \_\_\_\_\_

13. \_\_\_\_\_

14. \_\_\_\_\_

15. \_\_\_\_\_

16. \_\_\_\_\_

17. \_\_\_\_\_

18. \_\_\_\_\_

19. \_\_\_\_\_

20. \_\_\_\_\_

21. \_\_\_\_\_

22. \_\_\_\_\_

23. \_\_\_\_\_

24. \_\_\_\_\_

25. \_\_\_\_\_

26. \_\_\_\_\_

27. \_\_\_\_\_

28. \_\_\_\_\_

29. \_\_\_\_\_

30. \_\_\_\_\_

31. \_\_\_\_\_

32. \_\_\_\_\_

33. \_\_\_\_\_

34. \_\_\_\_\_

937

END TO I & G BIL

MAR 24 1971

VIA QUALITY CONTROL

23



April 22, 1969

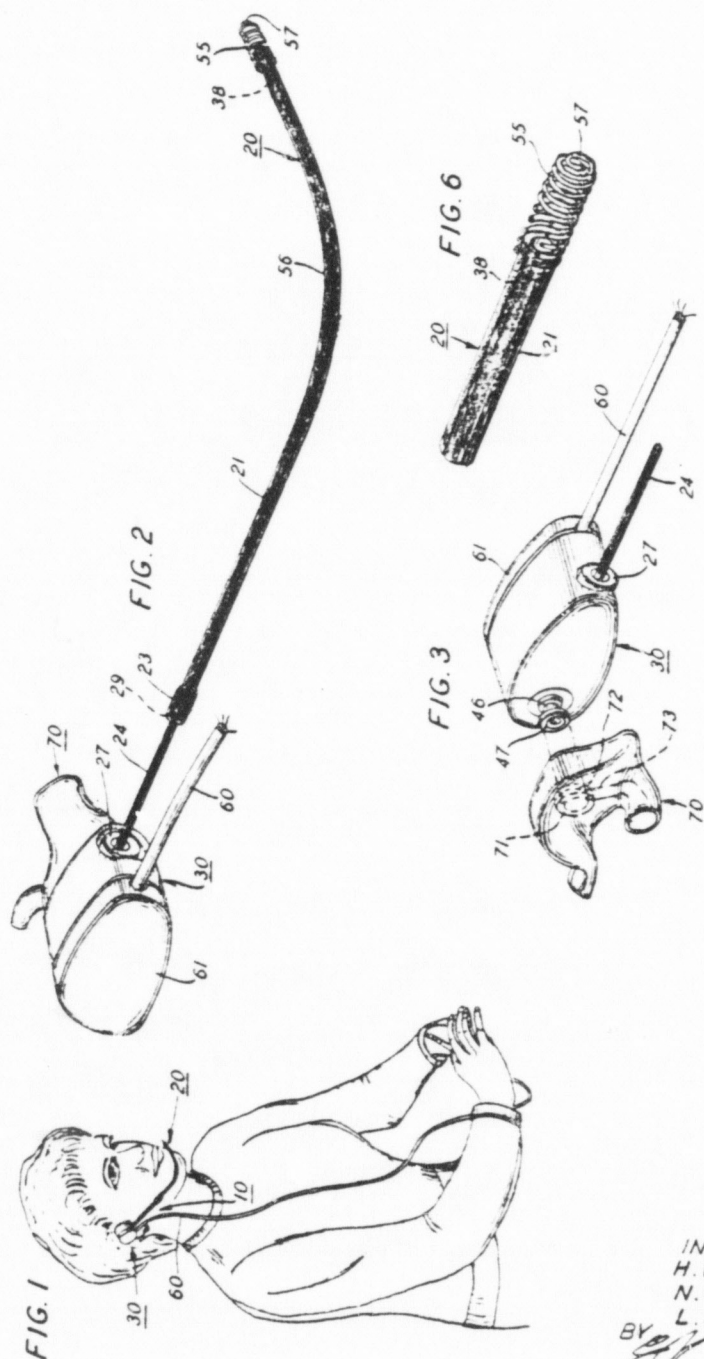
H. W. BRYANT ET AL

3,440,365

TELEPHONE HEADSET WITH ADJUSTABLE SPEECH TUBE

Filed Nov. 4, 1965

Sheet 1 of 2



INVENTORS  
H. W. BRYANT  
N. C. HAZELL  
L. W. MOSING  
BY *[Signature]*  
ATTORNEY

938

April 22, 1969

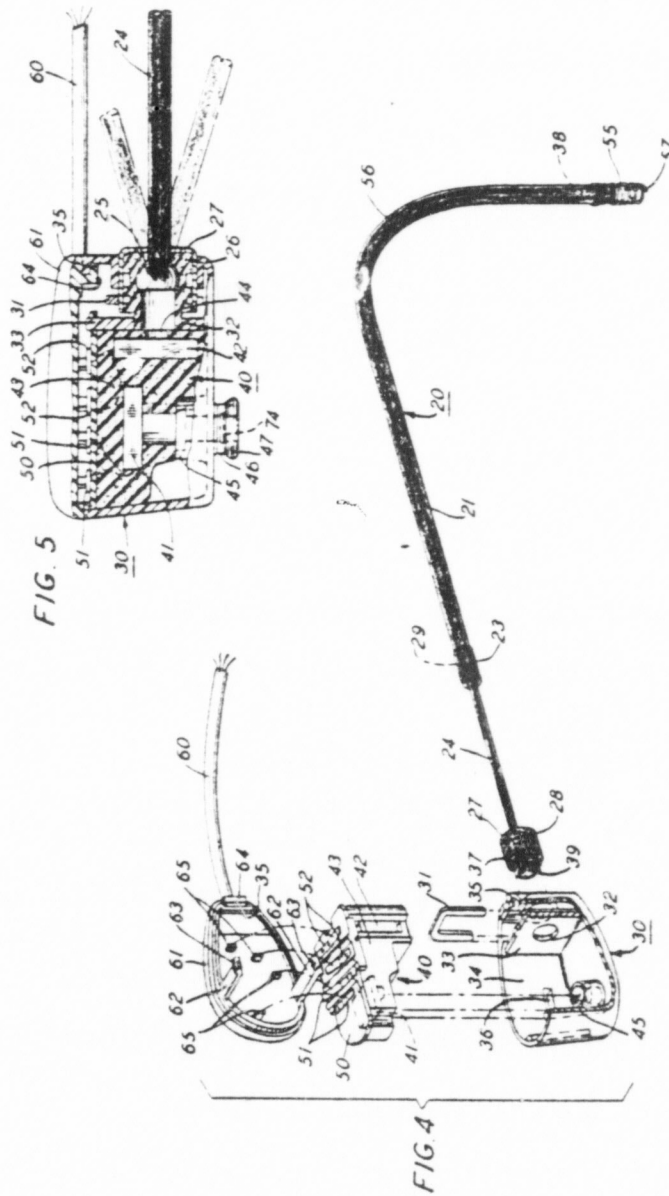
H. W. BRYANT ET AL

3,440,365

TELEPHONE HEADSET WITH ADJUSTABLE SPEECH TUBE

Filed Nov. 4, 1965

Sheet 2 of 2



939

1

2

3,440,365

## TELEPHONE HEADSET WITH ADJUSTABLE SPEECH TUBE

Herbert W. Bryant, Middletown, Norman C. Hazell, Freehold, and Lionel W. Mosing, Springfield, N.J., assignors to Bell Telephone Laboratories, Incorporated, New York, N.Y., a corporation of New York

Filed Nov. 4, 1965, Ser. No. 506,310

Int. Cl. H04m 1/05

U.S. Cl. 179-156

6 Claims

### ABSTRACT OF THE DISCLOSURE

A telephone headset is disclosed consisting of a housing, containing the transmitter and receiver, a two-piece speech tube connected to the housing, and an acoustic ear insert on which the housing is mounted. The housing can rotate on the ear insert, the fitting permitting this also constituting a part of the acoustic passage between the inner ear and the receiver. The inner portion of the speech tube is rigid and swivelably mounted to the housing. The outer piece is curved and also slidable and turnable with respect to the inner portion. The geometry allows adjustment of the headset to almost any wearer's head configuration.

This invention relates to transmitter-receiver units of the type supported during use upon the head of the user, and, in particular, to headsets worn by telephone operators.

An increasing concern for operator comfort as well as equipment performance has prompted much recent effort to improve radio and telephone headsets. Broadly, the two prime causes of wearer discomfort are the weight and bulk of the set, and the distribution of whatever weight is involved. Significant weight and size reductions are achieved by replacing the heavy magnetic core receivers and carbon-type transmitters with miniature balanced armature transducers of the type routinely used in hearing aid devices. These transducers operate advantageously in conjunction with acoustic pick-up tubes, and this expedient has also been employed in the telephone headset art to reduce weight.

However, several facets of the weight distribution problem have not been solved satisfactorily. Moreover, other important and persistent problems, including pick-up tube positioning limitations and the manner of support for the whole headset, require better solutions, preferably ones which in fact further reduce the weight distribution problem instead of complicating it.

One of the problems relates to headbands per se, which are necessary with most headset designs to provide the needed support. Headbands are inherently bulky, add to the headset's cost, and must be maintained and stored. For some applications as, for example, when other heavy headgear must also be worn, headbands are frequently inconvenient or unsuitable. Moreover, to a large number of hairdress-conscious women operators, headbands of any type are anathema because of their bulk and tendency to snag and disturb the hair. One typical substitute for the headband is a supportive lanyard, but these lend only loose support and consequently the set is not held stably in the required position. Other methods of avoiding headband support include suspending the set from a loop

placed around the ear, similar to eyeglass frames, or suspending the set from the eyeglass frame itself. The eyeglass clip method, however, tends to shift the optical axis, and is limited in any case to persons who wear glasses. The over-ear loop lacks stability and also disturbs the optical axis if glasses are also worn.

Another general problem involves the support or suspension mechanisms for positioning the headset in accordance with the wearer's mouth-ear geometry. One aspect is that conventional supports incorporated in headset designs in an effort to make the set adaptable to widely varying head geometry and wearing preferences, employ very complicated and bulky adjustment features. Simplified support designs have sacrificed at least to some extent the adjustability. Further, earlier support designs do not take into account adequately certain wearer preferences, particularly of telephone operators, which include location of the supportive pressure, manner of putting on and removing the set and movement of the transmitter independently of the receiver.

A related problem is that the positions in which operators are willing, or tend, to wear a given headset do not coincide necessarily with the position in which the set performs best. To treat this problem and the preceding ones simultaneously, requires acoustic refinements not found in prior art devices.

A further problem, principally one of acoustics but bearing importantly on operator comfort, relates to the receiver-to-ear seal. Tight seals are desirable from the transmission standpoint, but are achieved in today's headsets with considerable sacrifice in operator comfort.

Another drawback of headsets using acoustic pick-up tubes relates to the effects created under certain circumstances by operator speech sounds such as *b* and *p*. The operator's breath which produces these sounds is a strong puff that impinges full-force upon the tube entrance normally maintained about three-fourths of an inch in front of the mouth. The sidetone this creates is audible to operator and calling party; and at high levels is unpleasant and distracting to both. The effect is minimal if, as with sets having conventional size earcups, there are sufficient sound leakage losses inherently present in the set. However, the problem becomes acute if a receiver of high efficiency is employed. In such case the sidetone effects of *b* and *p* sounds compel the operator to place the tube entrance farther from the mouth or to use a reduced speech level. Either action weakens the transmission level and makes reception of operator speech by the calling party difficult.

Accordingly, a general object of the invention is to reduce substantially the degree of discomfort incident to wearing a telephone headset.

Another object of the invention is to improve the acoustic performance of telephone headsets.

A further object of the invention is to simplify the positionability of the several elements in a typical operator's headset.

A further object of the invention is to reduce the absolute number of elements necessary in a headset.

A still further object of the invention is to eliminate the unpleasant sidetone effects caused by puff sounds in a headset using an acoustic pick-up tube.

These and other objects are accomplished in accordance with the invention in a telephone headset in which a single, compact housing, containing the transducers

940



and all connections and supporting a widely adjustable acoustic pick-up tube, is suspended from an acoustic ear-piece inserted in the operator's ear.

In one embodiment of the invention, the housing is rotatably mounted on the earpiece. The speech tube is mounted in a ball-joint within the housing to permit adjustments in a large circular arc. Further rotative and longitudinal adjustments are achieved with a slide feature. The headset cord connector is integral with the cap to the housing, which reduces bulk and weight and facilitates cord replacement. The housing, speech tube and cord are thus placed well out of the operator's line of vision and away from her work area.

Advantageously, the plastic ear insert is molded to fit the particular ear geometry of the user. This expedient, well known in the hearing headset art, achieves not only the expected superior receiver-to-ear seal, but because of its snug fit provides a point of suspension for the headset proper that is secure, stable and surprisingly comfortable.

In accordance with another aspect of the invention, a puff screen is mounted at the entrance to the acoustic pick-up tube to reduce the sidetone effects caused principally by the sounds of *b* and *p*. The screen is an extended coil spring with inwardly-extending helical end portion and, advantageously, a plastic coating. The acoustic energy of the *b* and *p* sounds is dissipated by a turbulence produced when the waves impinge on the spring, which allows only a small fraction of these waves to pass at their original velocity.

Accordingly, a feature of the invention relates to suspending and acoustically coupling an operator's headset from an acoustic ear insert.

A further feature of the invention lies in employing a custom-molded plastic acoustic ear insert as a support for an operator's headset, on which the latter may be rotatably positioned.

A still further feature of the invention resides in a combination of added adjustments enabling the pick-up tube to be positioned and retained at any selected position adjacent the operator's mouth without impairing the acoustic couplings.

A still further feature of the invention involves a spring-like puff screen that alleviates the distortive effects of sounds such as *b* and *p*.

Other objects and features of the invention will be readily discernible in the description to follow of an illustrative embodiment thereof and in the drawing in which:

FIG. 1 shows a headset in place upon an operator;

FIG. 2 is a perspective of the headset;

FIG. 3 is a perspective showing the ear insert and the mounting coupling;

FIG. 4 is a perspective in expanded form showing the elements of the headset;

FIG. 5 is a perspective view in partial cutaway of the housing and acoustic tube mounting; and

FIG. 6 is a side perspective of a distortion reducing screen.

FIG. 1 shows a headset embodying the inventive concepts in place on an operator and designated generally as 10. Essentially, headset 10 comprises acoustic pick-up tube 20 and housing 30. A cord 60 attaches to housing 30. Pursuant to a fundamental aspect of the invention, headset 10 is suspended completely from an acoustic ear insert or earpiece 70, shown in FIG. 3 and described in detail later. This manner of suspension eliminates need for head straps or other supportive structure.

As shown in FIGS. 2 and 4, pick-up tube 20 comprises a plastic tube 21 at the end adjacent the operator's mouth and a rigid tube 24 at the other end. Tube 21 may be made with cellulose acetate and advantageously includes a straight section followed by a curved section 56 near the wearer's mouth. Tube 24 is preferably of stainless steel and includes an acoustic ball-joint 25 at one end. Ball-joint 25 is made advantageously of stainless steel or

a suitable lightweight material and, as in FIG. 5, provides a mounting for tube 21. Ball-joint 25 joins the housing in a slight interference in a resilient fitting 26 of neoprene or an equivalent, which serves as a frictional mounting socket. The fitting 26 is enclosed in a retainer 27 that seats in housing 30, and that includes a longitudinal acoustic passage 39. Tube 20 may be swivelled within the socket through a considerable circular arc, e.g., 15 degrees. A wide range of adjustments of the end of speech tube 21 with respect to the operator's mouth is thus possible, even without changing the position of housing 30 on earpiece 70.

Pursuant to the invention, tube 24 telescopes and rotates within the straight portion of tube 21 in a light friction fit therewith. A metal ferrule 23 is crimped to plastic tube 21 in order to retain an acoustic and mechanical sealing washer 29 around tube 21, in a substantial friction fit. The curved section 56 together with the ball-joint feature allows for jaw clearance for tube 21 so that the open end thereof can always be positioned next to the wearer's mouth. The longitudinal and rotational adjustment in conjunction with curved section 56 allows a full range of positions to accommodate any ear-to-mouth geometry for either male or female wearers. Tube 21 may be removed for replacement easily by a light pulling, but will retain stably any position of adjustment in which it is placed. Advantageously, tube 21 may be transparent so that any dust or foreign matter accumulation can be spotted and removed.

Pursuant to one aspect of the invention, a screen 55 covers the open end of plastic tube 21 to overcome sidetone effects caused particularly by *b* and *p* speech sounds. As shown in FIG. 2 and again in FIG. 6 in greater detail screen 55 is an elongated coil with a coned or helical end 57. Spring 22 is made advantageously, of steel music wire coated with a hard smooth plastic. The adjacent coils are closely spaced and the end helix spirals into a center point. Spring 55 serves to reduce the puff distortions by causing a turbulence in the speech air stream which helps reduce its forward velocity and dissipates some of its energy. The puff sounds are further reduced by a sintered disc 38 at the end of the tube by means of dissipation.

While the described puff screen may, of course, be employed to advantage on any acoustic pick-up tube, it is especially valuable to the instant invention because it helps make practicable the suspending of the headset from an acoustic ear insert. The tight acoustic seal between insert and ear transmits sound essentially without loss, so that without the screen the acoustic blasts to the ear resulting from the puffs would be severe.

As seen in FIG. 4, a disc of porous material 38 such as sintered stainless steel is situated in tube 21 inwardly of screen 55, to damp resonant peaks resulting from standing waves. Retainer 27 is attached and acoustically sealed to housing 30 by a clip 31 that fits through a pair of opposed slots 28 in the sides of the retainer. A flange 37 on fitting 26 snugly seats to an aperture 32 of partition wall 33 within housing 30. To the other side of wall 33 is a recess 34 into which transducer mounting unit 40 fits.

Unit 40 consists of a receiver-transducer 41 and transmitter-transducer 42, advantageously mounted at right angles to each other and individually surrounded by a form-fitting cushion of rubber-like material 43. Transducers 41 and 42 are of the miniature balanced armature variable reluctance type. This transducer can be obtained either as a receiver or as a microphone. The receiver, with the proper type coupling, can develop sound pressures in the ear that can be significantly higher than those produced by conventional receivers for the same electrical input. In the form of a microphone used in conjunction with an amplifier as, for example, that described in W. J. Brown patent application Ser. No. 455,714, filed May 14, 1965, and assigned to applicant's as-

941

signee, the transducer can deliver to the telephone line electrical power higher than that of the headset carbon microphone widely used in the industry. The impedance of transmitter 42 is a few thousand ohms at 1000 c.p.s.; that of receiver 41 is a few hundred ohms at 1000 c.p.s.

Apertures 44 are provided in the cushion 43 at two points. One point coincides with the acoustic aperture 32 that passes acoustic waves through housing 30 from tubes 21 and 24. The second lines up with an acoustic aperture 45 in housing 30, as shown in FIG. 4, that connects to earpiece 70. Aperture 45 occurs throughout the length of an acoustic fitting 46 that is mounted on housing 30 opposite the terminus of cord 60. And to which in accordance with the invention the supportive earpiece is fastened.

Unit 40 and terminal block 50 comprise in effect a single module that requires only manual insertion and not leads, that facilitates manufacture and that allows easy field replacement of transducers if necessary, from an on-hand supply. By this construction, enough room is saved in housing 30 to include other devices therein as, for example, a clock-suppressing varistor if desired.

A top transducer mounting unit 40 is a terminal block 50 that includes a first and a second pair of spring connectors 51 and 52, advantageously having a high palladium content. Spring connectors 51, 52 have sufficient tension to accommodate the various fits between the housing and the end cap. Block 50 is formed of a stiff, glass fiber-filled nylon resin. Electrical connections (not shown) are effected between connector pair 51 and receiver-transducer 41, and also between connector pair 52 and transmitter-transducer 42.

An end cap or cover 61 is molded directly onto the end of cord 60. A plurality of contacts—in this instance, four—are connected to the conductors of cord 60 and also molded directly into cap 61. Each contact 65 lines up with and touches a separate one of the spring contacts of connectors 51 and 52. Pursuant to an important aspect of the invention, molding of cap 61 directly to cord 60 eliminates need for a stayband, which reduces weight and saves space. Cap 61 has a locking tab 64 which catches beneath a lip 35 in housing 30. A pair of legs 62 each with an outwardly-extending end nub 63 are molded integrally with cord 60. Legs 62 fit into recess 34 and the nubs 63 lock into corresponding grooves 36 in the sides of housing 30 to effect the final closure generally of cap 61 upon housing 30. Cap 61 fits onto housing 30 so that cord 60 is parallel to tube 24. This makes it possible to wear the set comfortably upon either ear.

In accordance with a prime aspect of the invention, as shown in FIG. 3, support for the headset 10 is given by acoustic earpiece or ear insert 70. Earpiece 70 is custom-molded to fit the outer ear cavities of the wearer and includes an acoustic passage 73 between the innermost end and its outer coupling 71. An annular groove 72 around the inner diameter of coupling 71 allows earpiece 70 to be snapped on over a lip 47 on fitting 46 in a light interference fit. When so attached, housing 30 is rotatably adjustable with respect to earpiece 70. A disc of porous sintered steel 74 is lodged inwardly of lip 47 to suitably damp the response peaks of the acoustic system of the receiver. Separate plug inserts must be molded for left and right ears. In practice, each wearer is responsible for his or her own inserts, including storage and occasional cleaning.

Another important advantage of supporting the headset from an ear insert is that there is little or no low overhanging mass involved, to distract or disturb the operator. Also, since the entire headset is held essentially to the ear, no discernible movement of inertia can be produced by turning of the head. Moreover, what little torque is applied to the insert by the movement of the headset and speech tube is in the direction of the outer ear helix which serves to secure it further. Additionally, the unob-

trusiveness of the set resulting from its lightness and close fit to face, contributes much to its acceptance by telephone operators and consequently to better operator service.

The operation of headset 10 is simple, involving simply snapping together of housing 30 and of insert 70, and then placing of insert 70 into position in the ear and finally adjusting the speech tube to position the puff screen 55 with respect to the wearer's mouth in accordance with the various above-described inventive adjustments. As the entire headset, including a portion of the cord need weigh only about 18 grams, it is unnecessary to support it any way other than that described. However, some operators prefer to support some of the weight of cord 60 with a neck lanyard (not shown) worn in necklace fashion that fastens to cord 60 about two feet away from housing 30. The acoustic leakage losses to the outside are extraordinarily low, due, in accordance with the invention, to the compact tight construction throughout. With the puff screen located about three-fourths of an inch from the user's mouth, a high level of performance will occur regardless of the specific adjustment fit employed.

While several embodiments of the inventive concept have been shown and described, it is to be expressly understood that further changes and modifications may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. A telephone headset comprising: a transmitter, a receiver, and means for housing said transmitter and receiver; an acoustic ear insert comprising a rigid plug-like body with an outer surface, an outer ear helix, an ear canal extension and an acoustic through-passage running from said outer surface and including said extension; means for supporting said housing means upon said ear insert outer surface for rotation about an axis which when the insert is being worn is substantially normal to the side of the wearer's head; and means including said support means for acoustically connecting said through-passage and said receiver.

2. A telephone headset in accordance with claim 1 further comprising an acoustic tube having a rigid inner portion with a ball-joint at one end thereof and a curved outer portion slidably and rotatably mounted upon said rigid portion, and means including compliant material mounted adjacent said transmitter for frictionally and swivelably mounting said ball-joint in said housing, whereby said acoustic tube outer portion is selectively positionable with respect to the wearer's mouth without disturbing said headset housing and said ear insert.

3. A headset in accordance with claim 1 further comprising a rigid straight inner acoustic tube, means swivelably retaining an end of said inner tube within said housing, means acoustically connecting said inner tube and said transmitter, a compliant outer acoustic tube, means including a straight portion of said outer tube for slidably and rotatably mounting same upon said inner tube in a slight interference fit, and means including a curved end portion of said inner and outer tubes for effecting an adjustable clearance between said inner and outer tubes and the user's jaw, whereby the entrance of said outer tube is positioned next to the user's mouth regardless of head shape.

4. A headset in accordance with claim 3 wherein said outer acoustic tube further comprises means, including an elongated open wound steel spring axially aligned with and fixedly mounted on said tube end and having an inwardly-directed helical outer end, responsive to high-energy bursts of acoustic signals impinging thereon for creating an air turbulence thereby to dissipate said energy and reduce sleetone effects of said bursts.

5. A headset in accordance with claim 1 wherein said housing means further comprises a container portion for supporting said transmitter and said receiver, a contact board including a plurality of contact springs, a plurality

942

3,440,365

7

of electrical connections between said contact springs and said transmitter and receiver means, and a cap portion comprising a plurality of electrical contacts for effecting contact with respective ones of said contact springs.

6. A telephone headset in accordance with claim 1, wherein said housing support means comprises a lipped fitting, and said acoustic passage at said ear insert outer surface includes a corresponding annular groove to accommodate said lipped fitting in a light interference fit, thereby to enable said ear insert to be snapped on and off of said housing.

8

References Cited

UNITED STATES PATENTS

2,904,640	9/1959	Dreher et al. ....	179-156
2,566,313	9/1951	Cates .....	181-22
3,184,556	5/1965	Larkin .....	179-156
3,280,273	10/1966	Flygstad et al. ....	179-156

WILLIAM C. COOPER, *Primary Examiner*.

943



Oct. 18, 1966

D. W. FLYGSTAD ETAL

3,280,273

SELF-SUPPORTING OPERATOR'S HEADSET

Filed Sept. 11, 1963

2 Sheets-Sheet 1

FIG. 1



FIG. 2

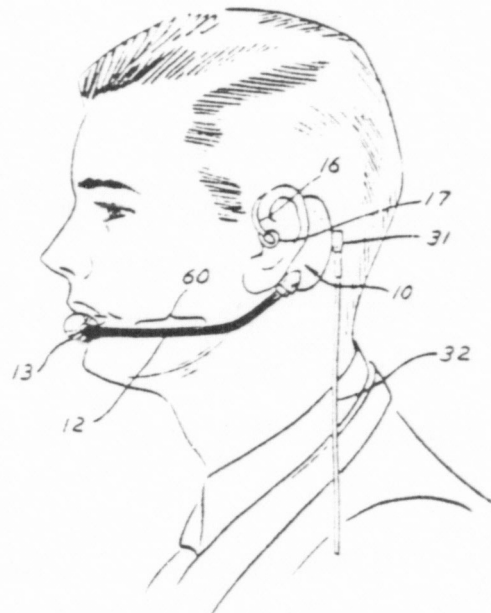


FIG. 3

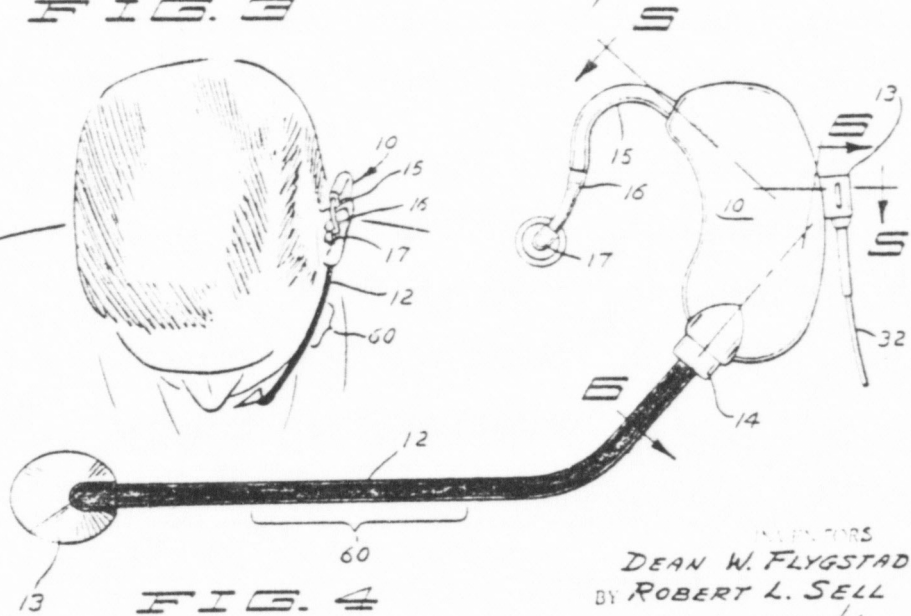
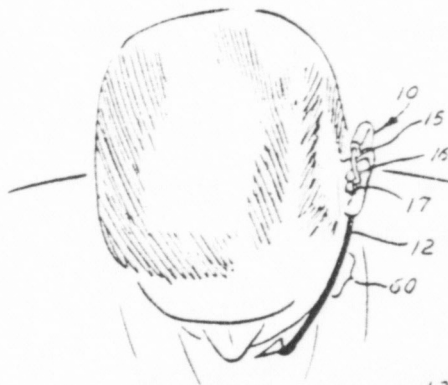


FIG. 4

INVENTORS  
 DEAN W. FLYGSTAD  
 BY ROBERT L. SELL  
 Carlson, Carlson & Sturm  
 ATTORNEYS

944

Eve

Oct. 18, 1966

D. W. FLYGSTAD ETAL

3,280,273

SELF-SUPPORTING OPERATOR'S HEADSET

Filed Sept. 11, 1963

2 Sheets-Sheet 1

FIG. 7

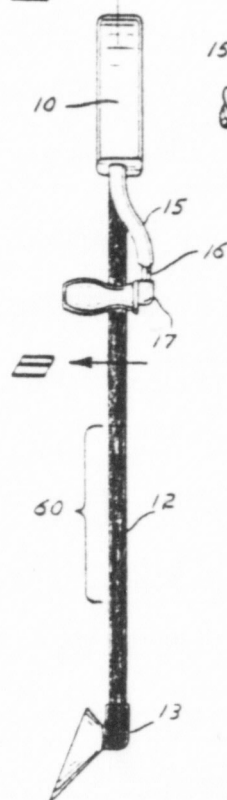


FIG. 5

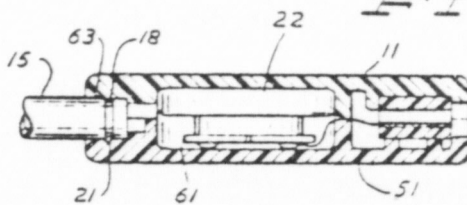


FIG. 6

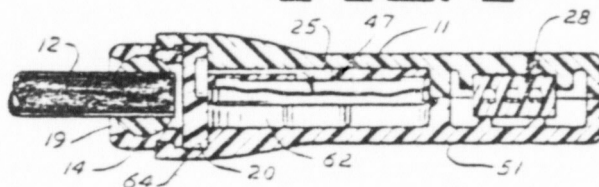


FIG. 8

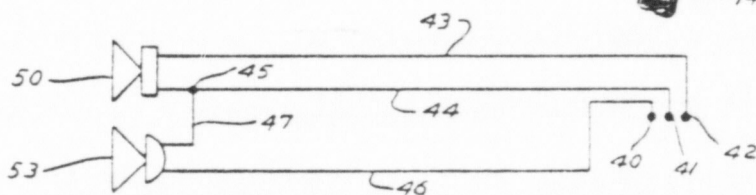
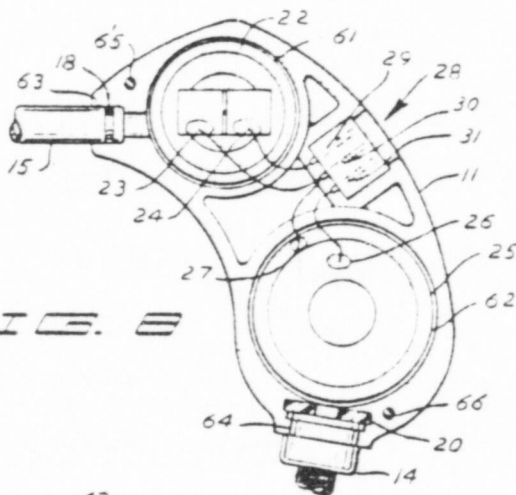


FIG. 9

INVENTORS  
DEAN W. FLYGSTAD  
BY ROBERT L. SELL  
CARLSON, CARLSON & ALLEN  
ATTORNEYS

945

1

2

3,280,273

## SELF-SUPPORTING OPERATOR'S HEADSET

Dean W. Flygstad, Roseville, and Robert L. Sell, Minneapolis, Minn., assignors to The Telex Corporation, Tulsa, Okla., a corporation of Delaware

Filed Sept. 11, 1963, Ser. No. 308,710

8 Claims. (Cl. 179-156)

This invention relates generally to two-way communication apparatus and is more particularly related to apparatus containing a receiver and a microphone that is intended to be worn by an operator.

In the prior art with which this invention is concerned, much effort has been directed to provide lightweight, comfortable and efficient headsets to be used, for example, by telephone operators. One common feature found in the prior art is an intermediate supporting structure to hold a receiver in sound transmitting relationship with an operator's ear and a microphone in sound receiving relationship with an operator's mouth. One recent example of such supporting structure is a headband which extends up and across a substantial portion of the top of an operator's head. Another example supports the necessary apparatus on the bow, or temple member, of a pair of eyeglasses. In still another example, a receiver may be supported on a headband and a microphone may be supported in structure adapted to be suspended around the operator's neck. These and other examples of the prior art may be found lacking in one or more of the desirable features noted above.

In our invention, we have provided a novel and useful improvement in providing a self-supporting headset. Briefly, our apparatus includes a housing that has depending sound conducting members, for supporting and stabilizing the headset on the head of an operator, and a suitably mounted receiver and microphone, all of which coact to provide a combination of elements that is lightweight, comfortable and efficient.

It is therefore an object of our invention to provide a novel operator's headset.

It is a further object of our invention to provide a self-supporting operator's headset.

These and other more detailed and specific objects will be disclosed in the course of the following specification, reference being had to the accompanying drawings, in which—

FIGS. 1-3 illustrate a preferred embodiment in position on an operator's head.

FIG. 4 is a side elevational view of the preferred embodiment of our invention.

FIG. 5 is a sectional view taken along section lines 5-5 in FIG. 4.

FIG. 6 is a sectional view taken along section lines 6-6 in FIG. 4.

FIG. 7 is a plan view of the preferred embodiment of our invention.

FIG. 8 is a sectional view taken along section lines 8-8 in FIG. 7.

FIG. 9 is an illustrative electrical schematic drawing of the electrical portion of our invention.

Referring now to the drawings in which like reference numerals have been applied to like elements of our invention, there is shown a self-supporting operator's headset comprised of a housing 10 which may contain a receiver 22 and a microphone 25 that are appropriately positioned to coact with a forwardly extending tube member 15 and a second forwardly extending tube member 12. Tube member 15 is in turn connected to a further tube member 16 that is adapted to carry an ear insert 17. Tube member 12 is mounted in a ball 19 and socket 14 and extends forwardly from the lower end of housing

10 and carries at its forward end a megaphone 13. Tube 12 is adapted to engage the cheek of an operator at a point or points along its length as indicated by bracket 60.

As will be apparent from the drawings, housing 10 is comprised of a pair of substantially identical members 11 and 51 which, when suitably disposed, combine and coact to define a pair of acoustically independent transducer mounting chambers 61 and 62 at opposite ends of the assembled housing 10. A further chamber is provided intermediate the acoustically independent chambers for mounting a three-terminal jack, indicated generally by the reference character 28.

Chamber 61 is adapted to receive and hold a receiver 22 having a pair of input terminals 23 and 24 that are connected through suitable conducting means to a further pair of terminals 29 and 30 on jack member 28. Chamber 61 also includes a forwardly extending aperture 63 which is adapted to receive the end of tube member 15.

Chamber 62 is adapted to receive and mount a microphone 25 which is provided with a pair of output terminals 26 and 27 that are connected through suitable conductors to terminals 30 and 31 on jack member 28. Chamber 62 also includes a generally forwardly extending aperture 64 for receiving socket 14 and sound baffling member 20. A further sound baffling member 47 is shown positioned at the bottom of chamber 62 on member 11. Sound baffling member 20 includes a first slot extending completely through and a second groove extending partly through member 20 to define an opening which is adapted to coact with a radially extending channel on the lower surface of baffling and gasket member 47, which in turn is in communication with a centrally located aperture for transmission of sound to microphone 25.

Member 11 also includes upwardly extending locating pin members 65 and 66 which are adapted to coact with similarly positioned apertures in member 51 to provide suitable registration of members 11 and 51 for assembling the apparatus. Members 11 and 51 may be assembled to form housing 10 after receiver 22, microphone 25, baffler 47 and 20 and jack 28 are positioned and suitably interconnected and may be cemented together through the use of any suitable adhesive which will provide the desirable acoustical insulating properties to ensure acoustical isolation between chambers 61 and 62.

Tube 15, which may be comprised of any suitable semi-rigid plastic material, is provided with a groove 18 which may coact with a pin member 21 mounted in member 51 so as to allow rotation of tube member 15 in aperture 63. Tube member 15 is, in turn, connected to a further tube member 16, which may be of a pliable material. An earplug 17 is shown mounted on the end of tube 16 and may be of suitable shape and compliance to be comfortably inserted in the auditory canal of an operator.

Tube member 12 is held in ball 19 through the use of a suitable adhesive. Ball member 19 is in turn rotatably journaled in a socket 14 which is in turn positioned and held in aperture 64 at the lower end of housing 10. Tube member 12 may also be comprised of a semi-rigid plastic material and has mounted at its forward end a megaphone 13 that is adapted to receive sound from the mouth of an operator and may be of any suitable size and shape.

In FIG. 4 of the drawing a suitable three-conductor plug member 31 is shown in position on jack 28 and is in turn connected to a suitable cable 32 that may be connected to suitable communication equipment which includes a source of signal and signal utilization means.

In FIG. 9 an electrical schematic representative of circuitry that may be employed with our invention is shown. A three-terminal plug represented generally by

946



reference characters 40, 41 and 42 is shown connected in circuit with a microphone 53 and a receiver 50, each of which has a pair of terminals. One of the terminals on receiver 50 is connected to terminal 41 through conductor 44 and is also connected to one of the terminals on microphone 53 through terminal 45 on conductor 44 and conductor 47. The other terminal on receiver 50 is connected to terminal 42 through conductor 43. The second terminal on microphone 53 is connected to terminal 40 through conductor 46.

It may thus be seen that our invention broadly includes a housing 10 which may have a first forwardly extending tube member 15 and a second forwardly extending tube member 12 and a jack 28 for connection to suitable communications equipment through cable 32.

Referring now to FIGS. 1, 2 and 3, our invention is shown in position on the head of an operator. Housing 10 is positioned directly behind the ear of the operator and tube member 15 extends forwardly to lie on the top of the ear and thence downwardly to provide a coupling to the auditory canal of the operator. Tube member 12 extends forwardly into engagement with the cheek of the operator along the area indicated by reference numeral 60 and the megaphone 13 is positioned in proximity to the mouth of the operator in a position which will provide for the most efficient transfer of intelligible sound energy from the particular operator using our apparatus.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described our invention, what we claim to be new and desire to protect by Letters Patent is:

1. An operator's headset comprised of an elongated hollow housing containing a receiver and a microphone, said housing being shaped to lie behind the ear of an operator, said housing also having a tubular portion extending forwardly from its top over the ear of an operator and into proximity of the auditory canal, said housing also having a tubular portion extending forwardly from its lower end into contact with the face of the operator and into proximity of the mouth of the operator whereby the housing is supported solely by the ear and face of the operator.

2. An operator's headset comprising: a housing having a portion adapted to engage the back of the ear of an operator, said housing being vertically elongated and having separate chambers in proximity to the top and bottom ends thereof, each of said chambers having an aperture extending generally forwardly thereof; a microphone in the bottom chamber; a receiver in the top chamber; a tube extending forwardly of the aperture in said top chamber to lie on top of the ear and downwardly to extend into the auditory canal of an operator; a further tube extending generally forwardly of the aperture in said bottom chamber, said tube being adapted to lie on the cheek and extend into proximity of the mouth of an operator.

3. The apparatus of claim 2 in which the further tube is pivotally mounted in the aperture in said bottom chamber.

4. The apparatus of claim 3 in which the tube extend-

ing from the top chamber is rotatably journaled in the aperture.

5. The apparatus of claim 2 in which first and second resilient gaskets, each having sound energy transmitting channels and apertures, coact to provide a conduit for the transmission of sound from the aperture on the bottom end of the housing to the diaphragm of the microphone mounted therein.

6. An operator's headset comprising in combination: a hollow housing including terminal means for connection to a source of signal and a signal utilization means, said housing being of generally arcuate shape to lie behind and engage the ear of an operator; a first forwardly and downwardly extending tube member at the top of said housing, said tube member being adapted to engage the ear of an operator along a portion of its length and cooperating therewith to support the housing on said ear; sound receiving means electrically associated with said terminal means, and associated with said tube member to supply sound energy to the auditory canal of an operator; a second forwardly extending tube member at the bottom of said housing, said tube member being adapted to engage the side of the face of an operator and having an opening adapted to be positioned in sound receiving relationship to the mouth of an operator; and microphone means electrically associated with said terminal means and associated with said second tube member to receive sound energy from the mouth of an operator.

7. An operator's headset comprised of a housing member adapted to abut the rear portion of an operator's ear; a forwardly extending tube member adapted to extend over the top of an operator's ear; a further tube member extending forwardly into proximity with the mouth of an operator and adapted to lie in engagement with the cheek of an operator, said housing and tube members cooperating to support and stabilize the headset on the ear of an operator.

8. Improved self-supporting communication apparatus comprising in combination: a microphone and receiver; a hollow housing including forwardly extending sound conducting members, one of said members being adapted to engage the top of the ear of an operator and to apply sound energy to said ear, and the other of said members extending into proximity of the mouth of an operator and being adapted to engage the cheek of an operator whereby said hollow housing is supported only by said sound conducting members; and means mounting said microphone and said receiver in said housing in acoustically independent relationship so that said one member provides sound energy to the ear of an operator and said further member receives sound energy from the mouth of the operator.

#### References Cited by the Examiner

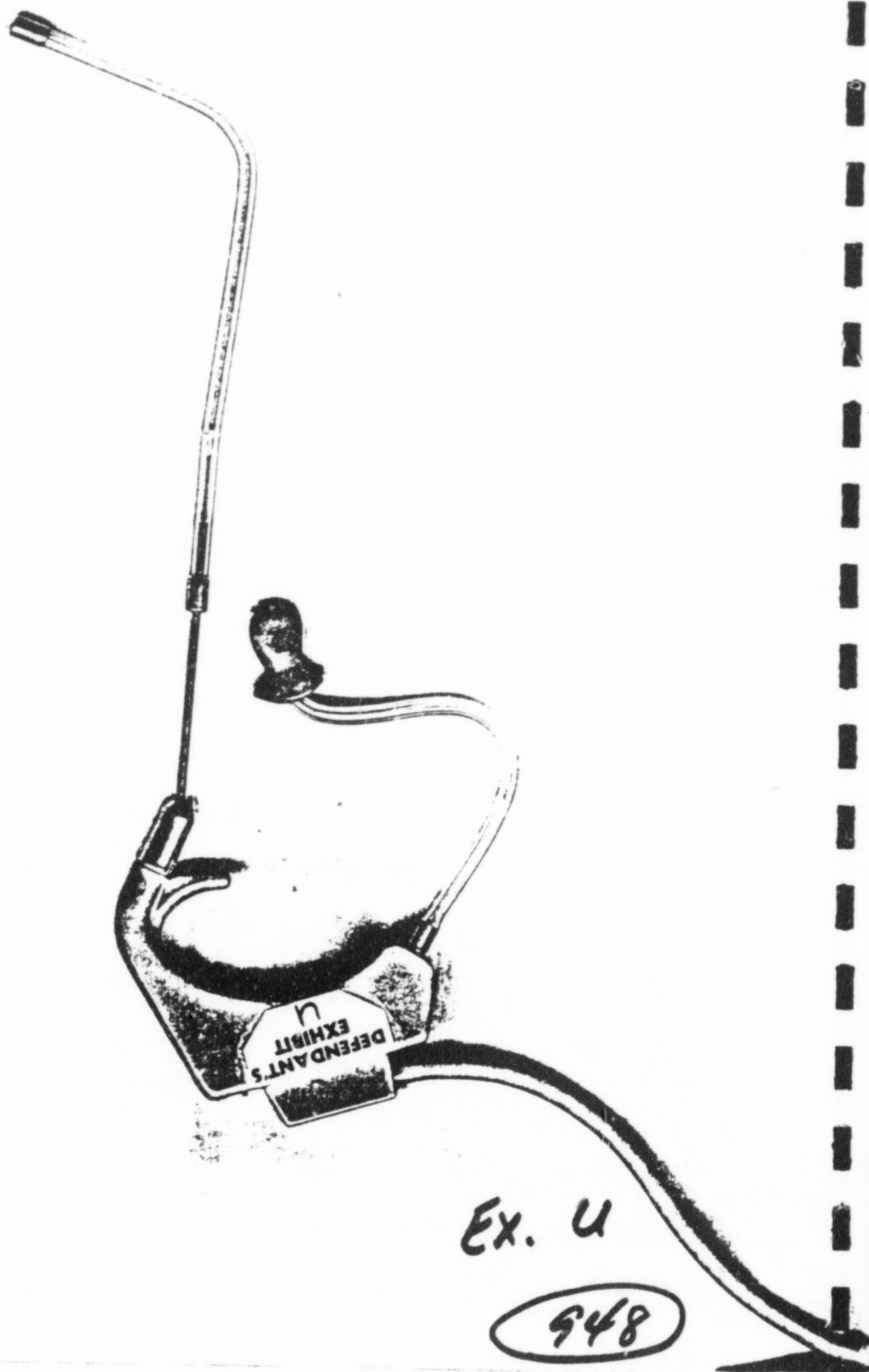
##### UNITED STATES PATENTS

2,904,640	9/1959	Dreher et al.	179-156
3,184,556	5/1965	Larkin	179-156

KATHLEEN H. CLAFFY, Primary Examiner.

WILLIAM C. COOPER, Examiner.

947



Ex. U

948



Ex. U.

949





PLANTRONICS, INC.  
Design - Development - Manufacture  
of  
Specialized Aircraft Electronics

111 JOSEPHINE STREET  
POST OFFICE BOX 604  
GARDEN 6-5858  
SANTA CRUZ, CALIFORNIA

March 27, 1962

Mr. Barney Langford  
Vice President Engineering  
Audiotone, Inc.  
P. O. Box 6717  
Phoenix 5, Arizona.

Dear Barney:

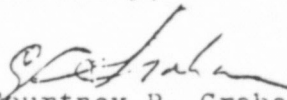
I am forwarding you the behind the ear capsule which you left with the tube mounted on it as a possible suggestion of the way in which this post auricly mounted unit might be approached. This tube with our amplifier and the Knowles 1502 transducer meets frequency response specifications.

I have tried several tube mounting configurations (from the top of the capsule and from the bottom of the capsule with heavy and light tubes) and have found that in order to solve the balance problem that the tube must be very, very light at the outward extremity. It would not be too difficult to make a very neat professional appearing light weight tube in three different sizes for this behind the ear unit with the approach I have used here. With the exception of the pick-up end, this tube which I have sent you fairly well falls into the necessary design limits as the MS-50 tube and does boost the low frequency response of the transducer smoothly and adequately for the job. Obviously there is more engineering to be done here, but this might be considered an adequate start.

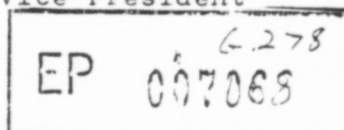
Very shortly Dick Fulmer will forward you a letter outlining all the requirements for the amplifier.

Looking forward to seeing you soon, my very best,

Sincerely,

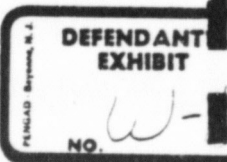
  
Courtney P. Graham  
Vice President

cc: John R. Johnson



Ex. W-1

950



Mr. Joseph Lagman

March 15, 1962.

FROM:

Mr. J. R. Johnson

Dear Joe:

We are pleased to report that we have worked out a satisfactory arrangement with Plantronics.

As you know, I am convinced that their development has excellent long range marketing potential and, therefore, if handled properly, can result in a plus to the Audiotone operation.

Attached is a copy of the agreement which Larkin and I have signed. This agreement is a long way from being a fancy legal document and possibly has some loopholes. However, we are not searching for those problems. The agreement does define a course of action that will certainly protect us for a reasonable period of time. If we can do a first class job from a design and economic standpoint we can throw the agreement away because I am convinced that good performance on our part will result in a continuing relationship with Keith and Court.

You are to begin immediately designing a "behind the ear" unit containing the necessary transducers and speaking tube plus an amplifier for this unit. In addition, cord and switching devices plus plugs will be needed in the final package. However, I am not too concerned about these matters at this time. A real effort must be made to design a good unit that will meet the P.A.A. requirements and be very low in cost. Quality cannot be sacrificed. However, every bit of ingenuity from a production, purchasing and design standpoint must be employed.

We are searching around for an aircraft radio transceiver which will give you the necessary capital equipment to proceed with the project. This we should locate in a few days. We will ask you to place a purchase order as soon as we find one. In addition, we have asked Ray Bohanan to make a thorough check of all light aircraft in regard to the arrangement of microphone and headset receivers in the airplane plus the impedance match that is common to the various types of aircraft and aircraft radios.

EX. W-2

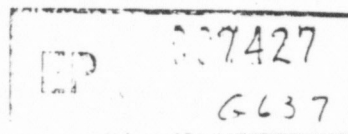
951

7426	DEFENDANT'S EXHIBIT
G-636	NO. W-2

There are very definitely two schools of thought on the speaking tube. Barney feels that the design of the tube is quite straight forward and that the material used in the tube is not critical from an acoustical standpoint. Court Graham takes an opposite view and is of the opinion that the material and construction is most critical. Court is quite candid in his statements when he admits that he cannot explain the phenomena but insists that some strange phenomena exists in regard to material and design. Court has successfully built a number of tubes that work well. Barney is a recognized expert on acoustics. Quite frankly, I respect both Barney and Court and I am in a bit of a quandry as to who is right.

So that we can move as expeditiously as possible I suggest that Barney take a limited amount of time, not more than a day or two, to see if he can come up with a satisfactory tube. If he is not successful then let's go directly to Court and have him make up what we will need. If this latter route is used we will never prove or disprove anything but we will get the show on the road. Let us all recognize that Court does have a working device. We are in this together and time can be saved by utilizing the knowledge that we have available. I would not recommend this course of action if the tube were a costly item where Barney's efforts might result in a real cost saving. This, however, is not the case.

After discussions with Court and Keith, I am of the opinion that the best way to design the behind-the-ear job is to bring the tube out the bottom instead of over the top. If you will study facial structures I am sure you will agree that this is about the shortest route and simplifies the problem of separating input and output. In addition, this will give a better balanced device which I feel will hang well on the wearer's ear. It will also simplify the problem of the user's glasses.



952



Mr. Joseph Lagman

Page 3.

You are going to have to do a real purchasing job to assure us the lowest cost transducers since this is a big element of cost. Every effort should be made to get the best possible deal. The other tough area will be the amplifier design. Cost must really be whittled out of this area.

Court Graham has considerable information developed to date on specifications and requirements. Please contact Court and arrange to have this information forwarded to you as soon as possible.

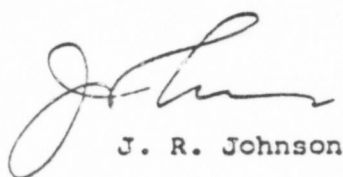
In regard to the \$3.00 deal on the MS50 program, Keith agrees that this is to cover mounting and sealing the transducer package. There will be no requirements on our part to drill and tap any holes. You will only perform the operations that you have performed in the past, without any drilling or tapping.

In the event this program goes as I think it can we should at some point give serious thought to manufacturing transducers for your requirements. With the volume potential that exists and the bad experience we have had with transducer manufacturers I am certain that we can get into the transducer business on a profitable basis.

I believe that you have a fine understanding of the problem and the ground rules defined so that the project can be pushed full bore during the next two weeks.

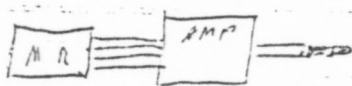
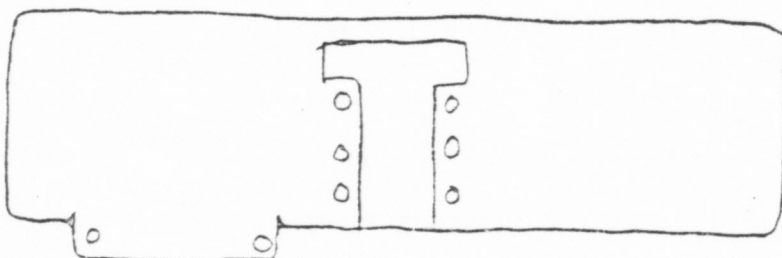
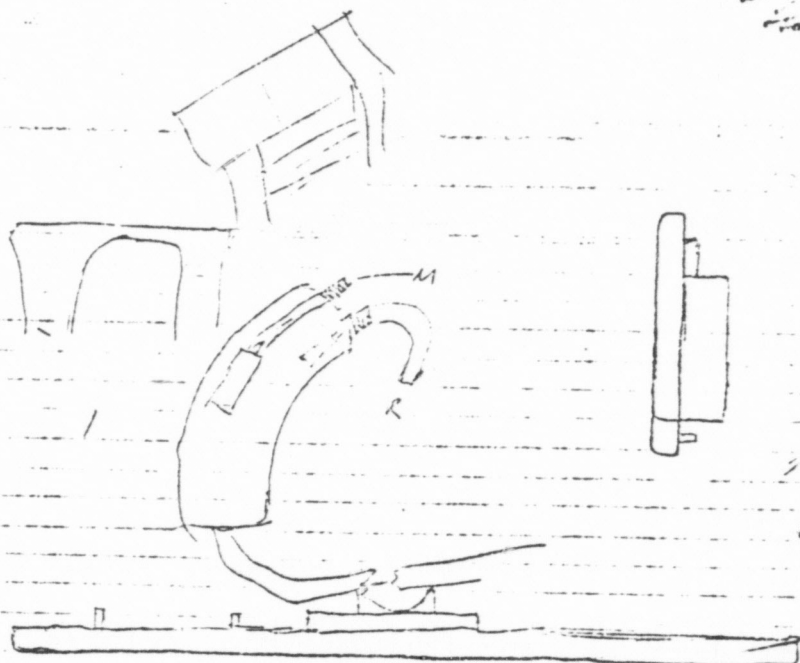
As soon as you begin to get some answers and the basic design is taking shape we should arrange a meeting, perhaps in Phoenix, with Larkin, Graham and myself, so that we can all review the project and carefully define our next step. I would like to do this sometime before the first of April. Please keep me advised.

Best personal regards.

  
J. R. Johnson

cc: Mr. Byron Langford  
Mr. Keith Larkin - Plantronics - Santa Cruz.

172 27428  
G 638 (953)



DEFENDANT'S  
EXHIBIT  
NO. W-9

EP 007099  
G 309

954

PACIFIC  
PLANTRONICS  
INC.

POST OFFICE BOX NO. 635  
SANTA CRUZ, CALIFORNIA  
TELEPHONE (408) 426-5858

Copy of correspondence sent to:

Mr. *W. J. Schiavoni* Date *2.5.66 136-67*

March 2, 1967

Mr. W. Schiavoni  
Engineering Director - Customer Telephone Systems  
American Telephone & Telegraph Company  
195 Broadway  
New York, New York 10007

Dear Mr. Schiavoni:

RECEIVED  
FEDERAL BUREAU OF INVESTIGATION  
U.S. DEPARTMENT OF JUSTICE  
NEW YORK OFFICE  
APR 4 1967  
OCT 6 1967  
Return to FBI Room 1710

SUBJECT: Lightweight Headset Considerations - Bell System Operators

PURPOSE:

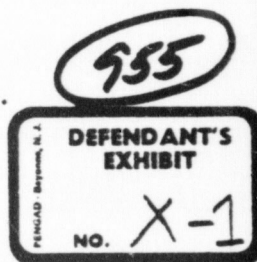
Pacific Plantronics, Inc., has supplied lightweight headsets utilizing the two tube, two transducer concept to the Bell System under KS number for the System's lease customer use since September, 1965. A resultant demand for a unit utilizing these same concepts has grown from within the Bell System by its internal operators for such a device. The object of this presentation is to request the American Telephone & Telegraph Company's consideration of PPI as a supplier of these internal needs along the following possible lines:

1. The development and production by PPI of a unit as conceptually illustrated in attendant illustrations 1A and 1B, with attached unit description, see Attachment I. Covered by Patent 3,184,556, see Attachment II. *PPI experience and hearing aid industry experience would indicate a much higher level of user acceptance of the universal soft ear tip design as employed in this MS-50 concept as opposed to the attendant problems of individual casting of complete ear molds for each individual user's ear, as is inherent in the design under Item 2, MS 51 earmold headset.*
2. Or, the refinement and production of the MS 51/T56, see Attachment III with accompanying Photographs 1D and 1E, (earmold mounted unit with idle gain reduction amplifier), covered by Patent 3,184,556.
3. Or, the production by PPI of Bell Labs preferential designs utilizing these patented concepts.

NPC

continued.

SUPPLIERS OF ASTRONAUT HEADSETS TO PROJECTS MERCURY, GEMINI AND APOLLO





March 2, 1967

- 2 -

The above Proposal for consideration in this letter are offered on a non-confidential basis.

HISTORY:

Pacific Plantronics was formed in late 1961 to design, develop and market lightweight headsets to the Telecommunications, O.E.M., and Federal and Aerospace market segments. Major customers include projects Mercury, Gemini and Apollo astronauts; United Air Lines, Pan American World Airways jet fleets; North American Aviation; the Bell System, General Telephone System, and the Independent Telephone companies. An entire series of concepts under Patent number 3,184,556, see Attachment II, were evaluated prior to entering the market place with the MS 50, see Attachment IV. (The Evolution of the KS 19796 Headset.) Bell System use of this basic configuration commenced with Pacific Telephone & Telegraph in early 1963, and some 18,000 units designated MS 30/T54 were sold. The first KS numbered units, MS 50/T55, were introduced in September, 1965. Since then over 50,000 such units have been delivered representing 60.5% of PPI total business in this time period.

COST CONSIDERATIONS:

Based on an assumed decision to physically separate the basic headset module from the amplifier module, with the supposition that the amplifier is a station issue and the headset is operator personal issue, certain headset target prices can be estimated. For example, a unit of the MS 51 configuration terminated separately from the amplifier module with a planned production in excess of 250,000 units with transducers estimated at \$8 per pair, would indicate a target price approaching \$25 per unit. Transducer prices are the leverage factor in any price analysis and the availability of lower cost transducing units would probably alter any cost considerations.

PPI CORPORATE PLANNING CONSIDERATIONS:

At this point in time, PPI is dependent upon the Bell System for sixty percent of its business. The acceptance by the General Telephone Company and the balance of the independent telephone companies of PPI products also largely rests on Bell System's KS acceptance. It is the express policy of PPI Directors and Management to reduce this dependency. An engineering group within PPI has been created with the sole mandate to develop products other than telephone headsets. A highly qualified consulting group outside of Pacific Plantronics has been retained to identify suitable products of outside companies, and to bring these into the PPI household by outright purchase or merger. Thus, it is the policy of PPI to relieve a one-product, one-customer dependency, as evidenced in our Bell System relationship, as rapidly as possible and to establish a posture more comfortable to both PPI and the Bell System.

continued.

956

February 28, 1967

- 3 -

PPI CORPORATE PLANNING CONSIDERATIONS - continued.

PPI, through continuing contact with the Bell System, has been made aware of a new BTL lightweight headset, the Model D\*, under-going field evaluation. We are apprised that the Bell System Planning calls for the introduction of this unit in late 1967, both to Bell System internal operators and to the system's lease customers. The impact of such a plan upon PPI would be to virtually eliminate its sales to the telephone market. (True even if PPI units are continued to be offered.) We are of the opinion, based upon extensive discussion with our patent counsel that the features of the Model D headset fall under the inventive concepts of Larkin Patent 3,184,556. The above considerations are brought to your attention in recognition of the well developed Bell System image in its fair treatment of qualified suppliers.

\*Substantially the same concept as evaluated by PPI in 1962, see Attachment IV, MS 51, earmold constitutes tube to ear connection.

QUALIFIED SUPPLIER CONSIDERATIONS:

PPI has proven itself an on-time quality supplier to the Bell System. Original demand estimates, as provided PPI by the Western Electric Company, would have called for production of some 20,000 units through the current date. PPI has delivered a fine product, 50,000 units, on time against a demand over 2-1/2 times that originally estimated. It is our position, with pride, that we are a supplier well qualified technically with the capacity to effectively service the Bell System's internal headset requirements consistent with quality, delivery and cost requirements imposed.

Sincerely,

PACIFIC PLANTRONICS, INC.

  
C. P. Graham  
President

CPG:jps

Attachments *yes attached*

957

Enc

HEADSET DESCRIPTION  
MS50 TYPE SECOND GENERATION  
(DESIGNATED MS50-45)

I. GENERAL DESCRIPTION:

A conceptual design for a "second generation" MS50 headset is shown in the illustrations attached. This headset is a capsule type with the same functional features as the present MS50 (KS19796) headset and in addition would incorporate a number of improvements.

II. PHYSICAL DESCRIPTION:

A description of the headset follows: The capsule contains both the microphone and receiver transducers. The voice acoustic tube conducts sound from the corner of the users mouth to the microphone transducer. Sound from the receiver transducer is conducted through the ear-tube and through a small flexible tip which rests inside the outer ear. The capsule is optionally used with the headband provided or may be clipped to the bow of the users eye-glasses, or comb-mounted for use by the ladies.

A small 4 wire flexible cable conducts electrical signals from the capsule to the switchboard. An amplifier, operating on current supplied from the telephone circuit, amplifies the microphone signal to the proper telephone level.

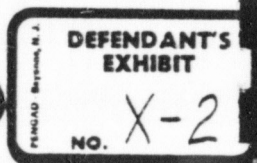
The improvements over the present MS50 headset would include the following:

1. Full v-rotational voice tube coupler
2. Improved isolation between the receiver and microphone transducers while retaining or improving the shock characteristics
3. Aesthetic design features.
4. Improved amplifier characteristics (see T56 attachment.)

Several options exist in the amplifier and cabling, depending on the end use and the economics of the usage. If the amplifier were to be incorporated in the desk-set or switchboard, then the headset would consist of the capsule, cabling and plug. To be fully compatible with present installations, the amplifier would be external to the switchboard or desk-set. The amplifier may be packaged in a separate plug-in module with the headset-cable attaching to the module by a plug and receptacle, or the amplifier could be contained in a small

ATTACHMENT I

958





cable junction like the present KS19796 headset. The former arrangement is more economical for switchboard service. The latter arrangement allows coil-cord mobility for the user without the required usage of shielded coil-cords (a possible source of reduced reliability). It would appear that both configurations may be desirable.

ATTACHMENTS:

T56 Idle Gain Reduction Amplifier, Discussion

Illustration 1A: MS50-45 Conceptual Illustration, Headset,  
Second Generation, Headband Mounted

Illustration 1B: MS50-45 Conceptual Illustration, Headset,  
Second Generation, Eyeglass Mounted

Illustration 1C: MS50-45 Conceptual Illustration, Headset,  
Second Generation, Comb Mounted

959



EYEGLOSS FRAME MOUNT  
MS50-45  
ILLUSTRATION 1A

960



HEADBAND MOUNT  
MS50-45  
ILLUSTRATION 1B

961





COMB MOUNT  
MS50-45  
ILLUSTRATION 1C

962

PACIFIC PLANTRONICS, INC.

Patent Position on Miniature Microphone-Receiver Headsets

Larkin U. S. Patent 3,184,556 covers headsets which include a microphone and an earphone disposed to be supported adjacent a wearer's ear with the first acoustical tube attached to the microphone for coupling acoustic energy thereto from a position adjacent the wearer's mouth and with a second acoustical tube attached to the earphone for coupling acoustic energy therefrom to the wearer's ear.

British Patent 1,009,818 provides corresponding coverage in Great Britain.

HEADSET DESIGNS PROTECTED BY PATENT

MODEL MS-50: Headband mounted and eyeglass-frame mounted configurations each include a first acoustical tube positioned between the microphone and the wearer's mouth and a second acoustical tube positioned between the earphone receiver and the wearer's ear.

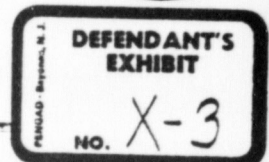
Features protected by aforecited Larkin U. S. and British patents.

MODEL MS-51: Auricle and post-auricle configurations mount the microphone and receiver on a custom-fitted casting of the wearer's ear.

Features protected by aforecited Larkin U. S. and British patents.

Earform molding apparatus and method also covered by Wilson pending patent application.

ATTACHMENT 111



MODEL MS-57: Microphone and receiver are contained within the earbar support of an eyeglass frame. Features protected by aforesaid Larkin U. S. and British patents.

AVAILABLE OPTIONS: Background-noise attenuator adaptor model PAC-1. Attaches to the end of the microphone acoustic tube in position in front of the wearer's mouth. Features covered by pending U. S. patent application.

9654



HEADSET DESCRIPTION  
MS51 - EARMOLD MOUNTED TYPE

I. GENERAL DESCRIPTION:

The MS51 headset is an earmold mounted type. The headset is supported adjacent to the ear by a form fitted plastic earmold.

II. PHYSICAL DESCRIPTION:

A description of the headset follows: The housing containing the microphone and receiver transducers snaps into the earmold. Sound from the receiver transducer is conducted to the ear through the tube-channel in the earmold. The voice acoustic tube conducts sound from the corner of the users mouth to the microphone transducer. The voice tube is adjustable in length to accomodate the difference in head sizes.

A small 4 wire flexible cable conducts electrical signals from the capsule to the switchboard. An amplifier, operating on current supplied from the telephone circuit, amplifies the microphone signal to the proper telephone level. (See attachment for amplifier discussion)

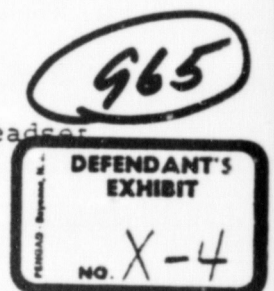
Several options exist in the amplifier and cabling depending on the end use and the economics of the usage. If the amplifier were to be incorporated in the desk-set or switchboard, then the headset would consist of the capsule, cabling and plug. To be fully compatible with present installations, the amplifier would be external to the switchboard or desk set. The amplifier may be packaged in a separate plug-in module with the headset-cable attaching to the amplifier by a plug and receptacle, or the amplifier could be contained in a small cable junction like the present KS19796 headset. The former arrangement is more economical for switchboard service. The latter arrangement allows coil-cord mobility for the user without the required usage of shielded coil-cords (a possible source of reduced reliability). It would appear that both configurations may be desirable.

ATTACHMENTS:

T56 Idle Gain Reduction Amplifier, Discussion

Photograph ID: MS51 Developmental Model, Earmold Type Headset

ATTACHMENT III



HEADSET DESCRIPTION MS51 - EARMOLD MOUNTED TYPE  
(Page 2)

Photograph 1E: MS51 Developmental Model, Earmold Type Headset,  
with T56-1 Idle Gain Reduction Amplifier in  
Plug Housing

966

MSA For Info

Telephone 1-800-368-5800  
Cable A0000

## ADVANCED DESIGN AMPLIFIER FOR HEADSETS, DISCUSSION.

### DESIGNATED T56 IDLE-GAIN-REDUCTION AMPLIFIER

#### BACKGROUND

The function of the amplifier in the PPI headset is to amplify the relatively small signal from the microphone transducer to a level which will operate the telephone communications circuits.

The amplifier in the KS 19796 headset has 53 db of gain, is designed to match the output level of a median WE 52 headset. It is designed to track the output/current characteristics of the WE 52 to low output levels (-30 dbm) so that it will operate in switchboards and desk sets which have built-in booster amplifiers, designed to standardize the headset output.

#### NEW DESIGN

Operating from the philosophy that hybrid-micro-circuitry can effect manufacturing economies, and allow the increased usage of the semi-conductor as a component element without corresponding cost penalty, a new amplifier was designed at PPI. The usage of additional active components achieves much improved specifications especially over a wide variation of current and voltage, and additionally allows other desirable features. This amplifier has the option of 0 dbm output (for 98 db SPL), or -6 dbm output. The 0 dbm option would be used where it is desired to match the T-1 transmitter response characteristics. The -6 dbm option would be used where mating of levels with WE 52's is required (such as radio dispatcher installation).

The amplifier has a flat output with changes of current and thus will operate much more efficiently in low current applications. Figure 1 shows comparative response with current of the T56 amplifier, the KS 19796 headset amplifier, and a WE 52 (N-1 transmitter element).

Regarding other characteristics that have been obtained with added circuitry, the following are examples:

1. Reduction of amplifier gain when the user is not talking, thus suppressing background noise.
2. By incorporating suitable time delays in the removal of the gain reduction of (1) it is possible to suppress clicks, and pops such as from typewriters and accounting machines, which are a prevalent source of noise in offices.
3. By amplifier design, the output can be made to hold constant with changes in current, or even be made to increase as the current is reduced. (See Figure 1.)

967



ADVANCED DESIGN AMPLIFIER FOR HEADSETS  
PAGE 2

4. The output impedance can be made to increase as the current is lowered, thus providing an excellent longline hybrid termination for both a single or paralleled headset combination.

The amplifier design was kept simple and of a form which can be miniaturized by hybrid micro-circuitry. There are no large components such as transformers. Illustrative of the success of this phase of the design is the fact that the new amplifier is packaged for demonstration purposes with discrete components in the same space as the present amplifier in the KS 19796 headset (1.25 inches diameter and .5 inches high, including terminal receptacles.)

FUNCTIONAL PERFORMANCE

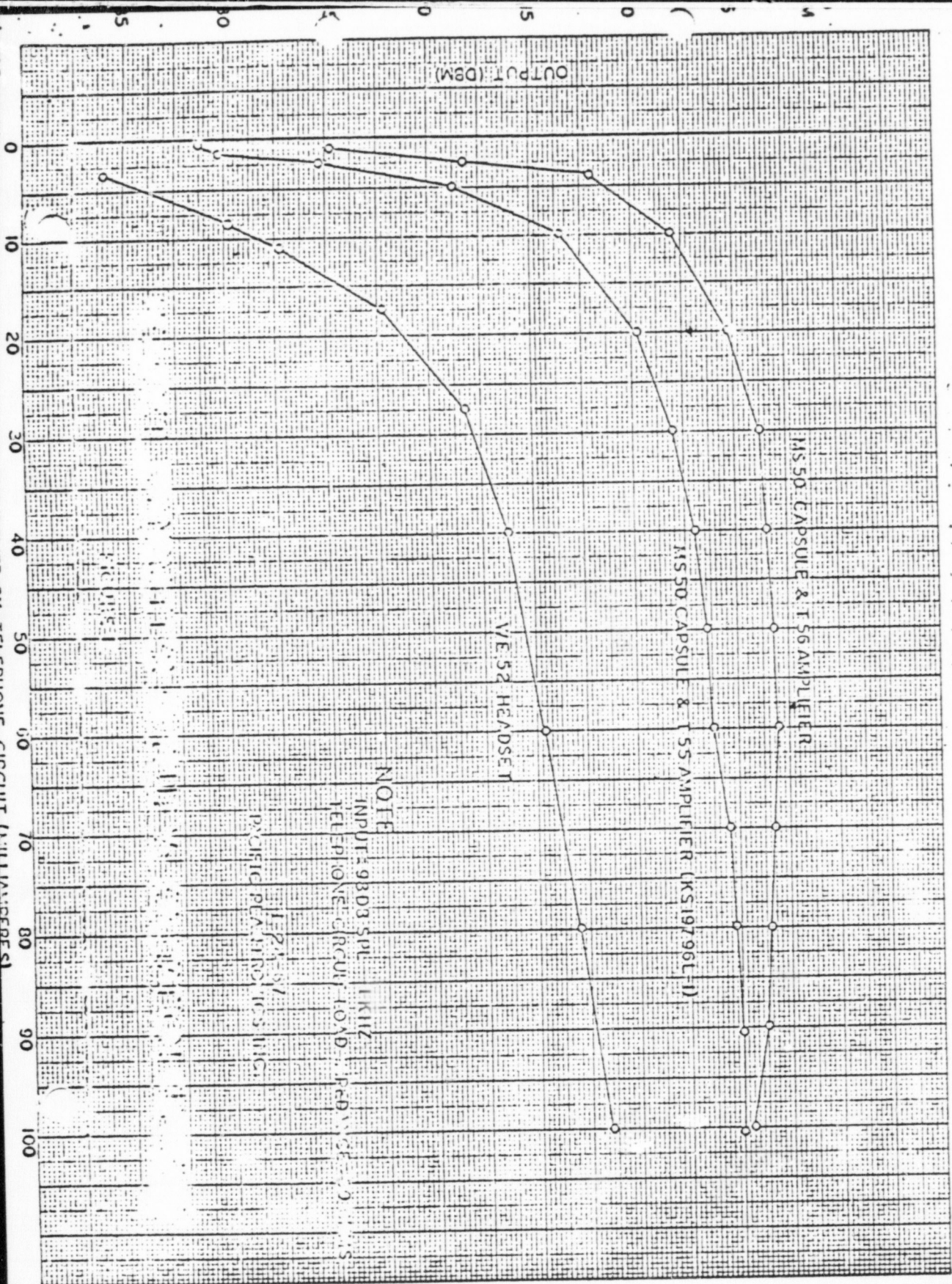
1. General - Operates from the current supplied by the external circuit: 5 to 136 MA. (The 136 MA is the current drawn from the worst-case PBX in service.)
2. Output Level - 0 dbm or -6 dbm (option) at 1 KC, 100 MA for 98 db SPL (Ref: .0002 dynes/cm<sup>2</sup>) into 50 ohm load. The design also allows the headset level to be standardized at any value within reason by the value of one resistor.
3. Output Level Variation with Current - See Figure 1
4. Frequency Response - The amplifier terminates the microphone transducer the same as the KS 19796 amplifier.
5. Gain Reduction (when not speaking) - Up to 22 db. The value of reduction is set by the value of one resistor. Although the full 22 db gives excellent background noise rejections and communications fidelity under the majority of conditions, the optimum solution to best satisfy the total population of conditions is a compromise. Field tests are currently in progress by PPT to determine the optimum specifications. This study includes the sound level values at which the gain change occurs.
6. Stability of Gain-Change Point with Current -  $\pm 2$  db, 10 MA to 100 MA, is achievable. The gain change action is maintained over the complete voice-transmission current range.
7. Warm-up Time - Less than 20 milliseconds from application of current.
8. Parallels - With another amplified headset and with a WE 52 headset directly across its terminals.

967A

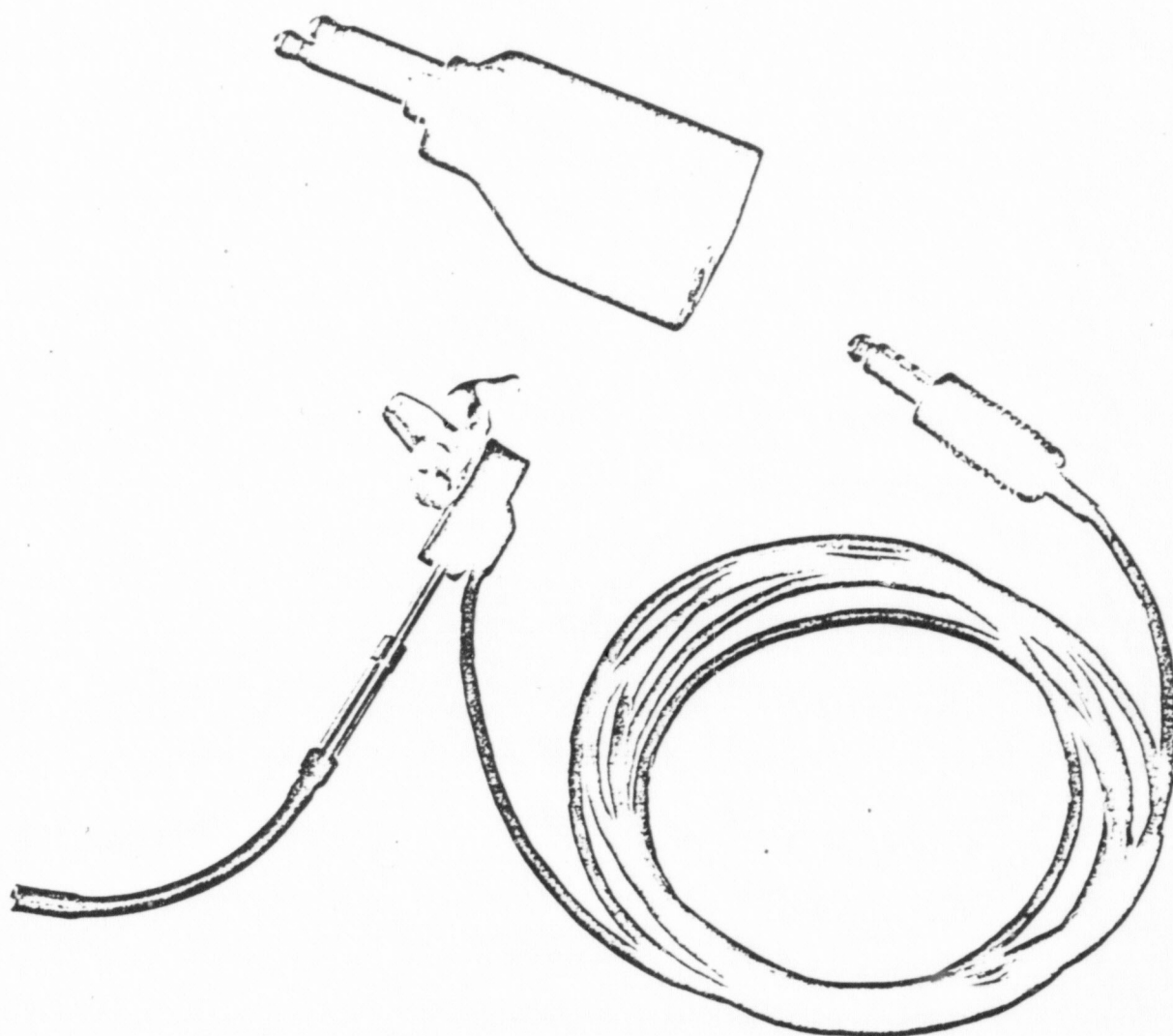
9. Transients - Withstands both the slow rise time transients caused by lightning strokes, and the fast rise time transients caused by inductive circuits.

968







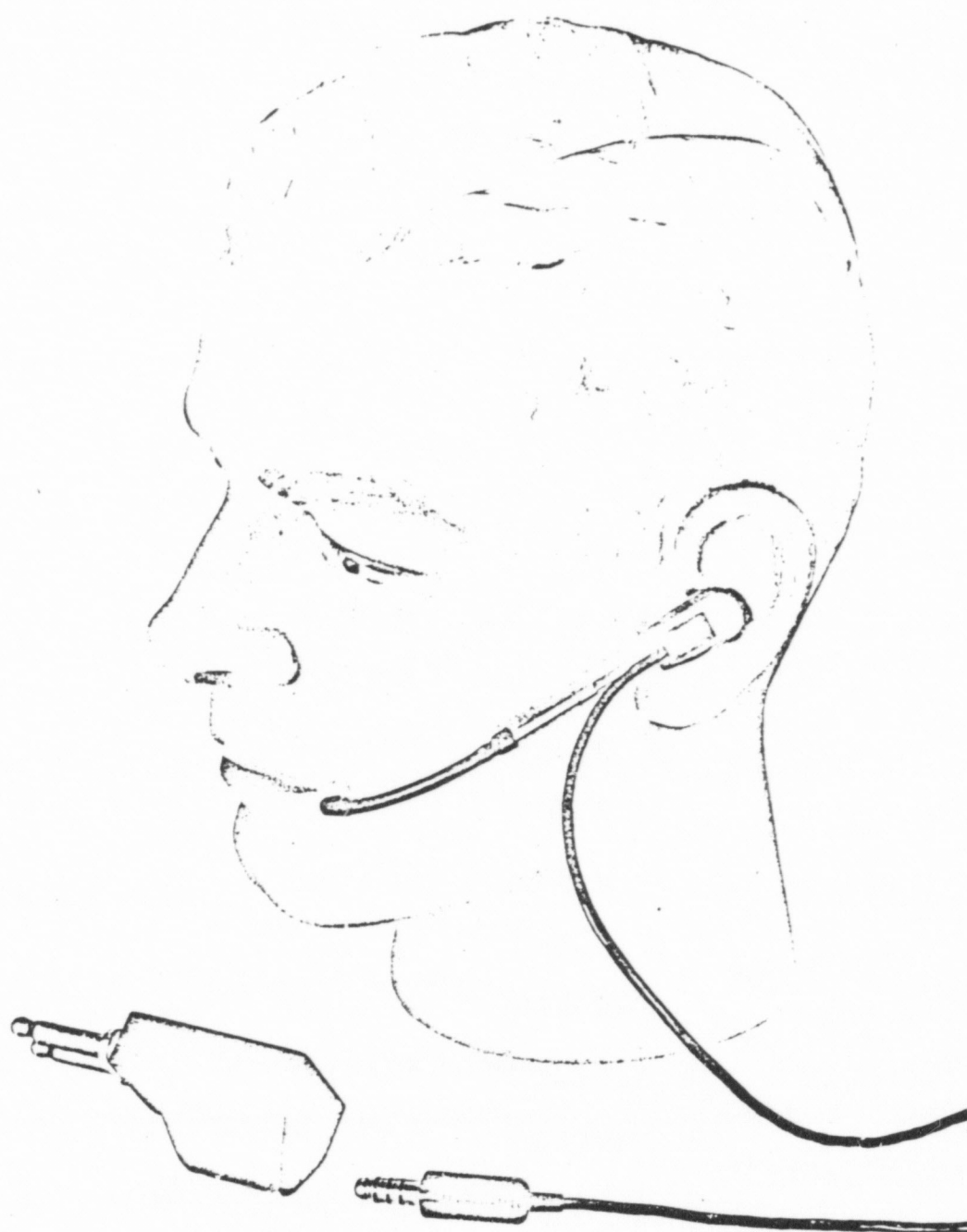


**IDLE GAIN REDUCTION  
AMPLIFIER  
T56-1**

**EAR MOLD  
MOUNT  
MS51-2**

**PHOTOGRAPH 1D**

**970**



IDLE GAIN REDUCTION  
AMPLIFIER  
T56-1

EAR MOLD  
MOUNT  
MS51-2

PHOTOGRAPH 1E

971

THE EVOLUTION OF THE KS 19796 HEADSET

"A review of the various preliminary design considerations evaluated by Pacific Plantronics, Inc. in adapting acoustic transfer tubes to miniaturized transducers for use as lightweight microphone-receivers."

EP 4795

972

ATTACHMENT IV

DEFENDANT'S  
EXHIBIT

NO.

X-5



### III. MS51

#### MOLDED EARPIECE SELF-SUPPORTING HEADSET

In a continuing effort to eliminate the headband completely, the MS-51 was developed and was considered an optimum design providing a direct solution to the mounting problem. This design concept involved packaging both microphone and receiver transducers in a "cannister" and a molded earpiece shaped to each individual user's ear, was used to support this device, as well as providing an acoustic transfer tube for reception. Microphone pick-up was provided by means of an acoustic tube.

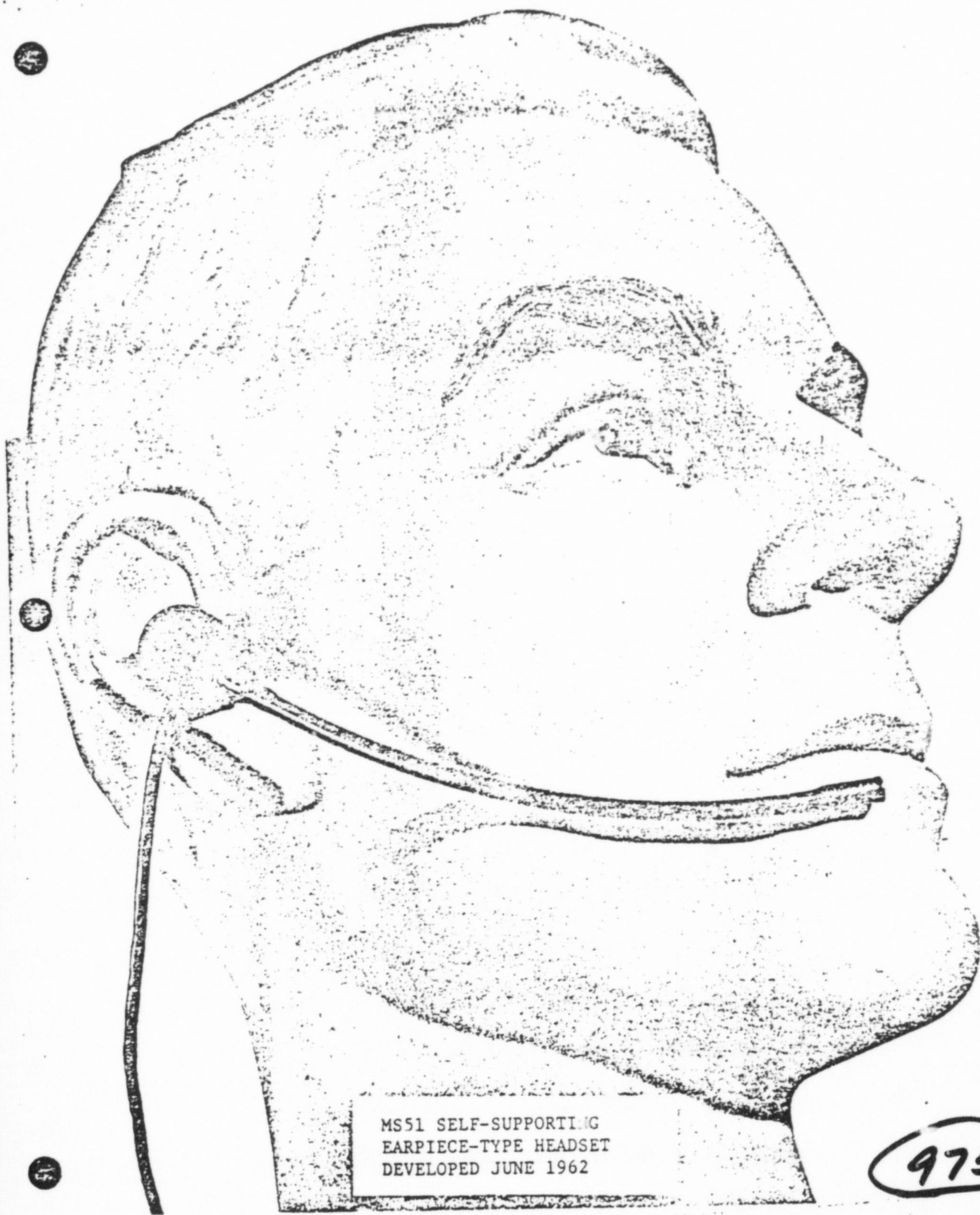
Units of this type were sold to North American Aviation in June of 1963.

The primary reasons for not introducing this concept to the telephone and other markets were: 1) molded earpieces required individual casting, 2) personal-

MOLDED EARPIECE SELF-SUPPORTING  
HEADSET

ized molded earpieces could become lost and considerable logistics problems might be encountered in supplying these individualized components, 3) the concept of placing "a support device" in the ear encountered initial telephone company resistance. Research within the telephone, general communications and hearing aid markets supported our conclusions that any "in-the-ear" devices must be proven.

On the basis of these points, Plantronics elected to hold the introduction of this concept in favor of the MS-50 model which utilizes a soft ear tip supported by a headband and does not require special molding. It was felt that the MS-50 approach was more evolutionary in nature, and would provide the first step in introducing the "ear insert" concept to the communication industry and the public in general.

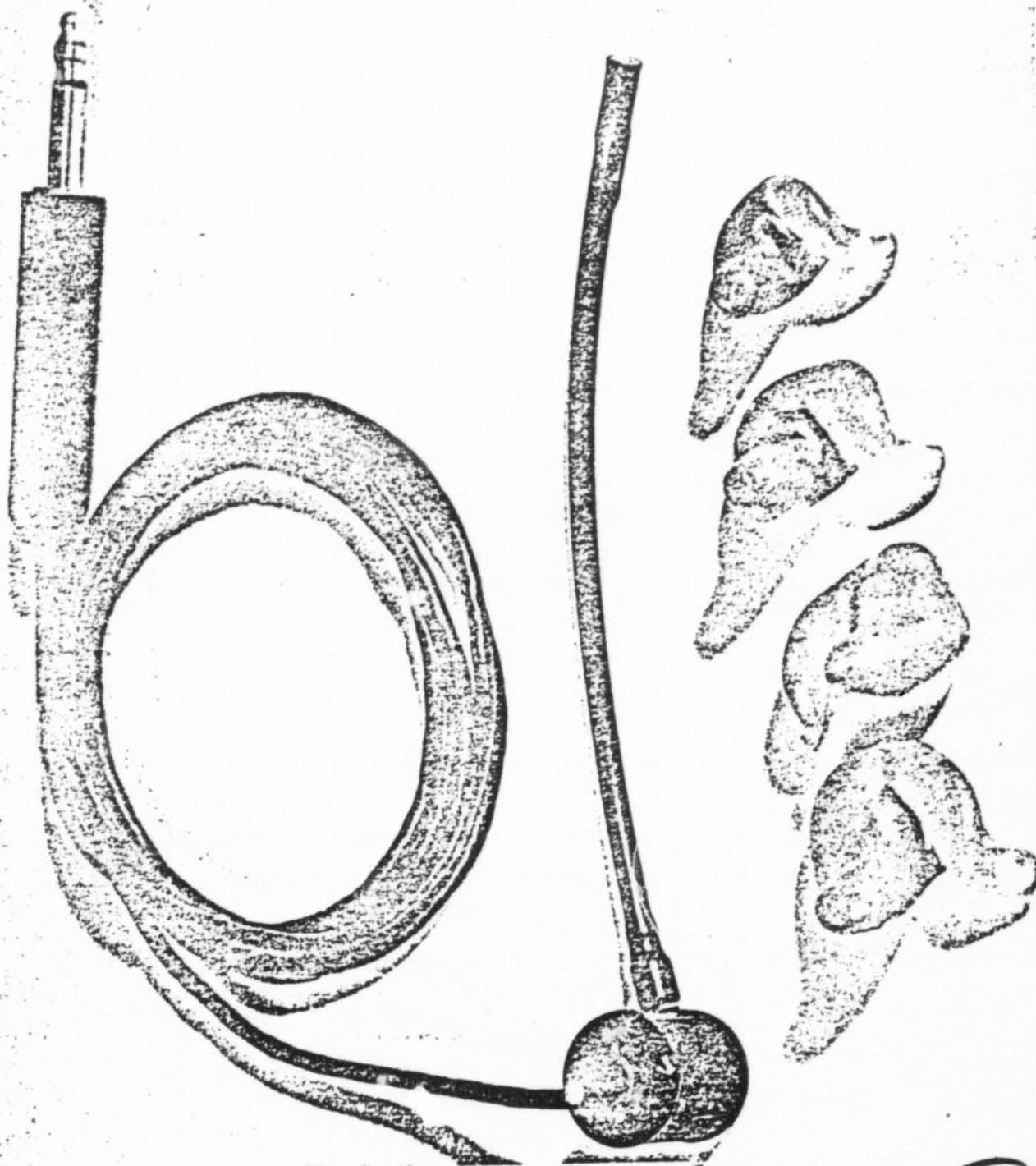


MS51 SELF-SUPPORTING  
EARPIECE-TYPE HEADSET  
DEVELOPED JUNE 1962

975

4810



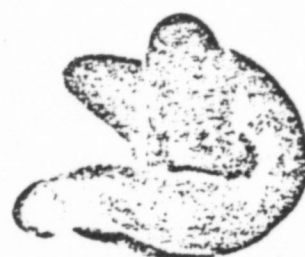
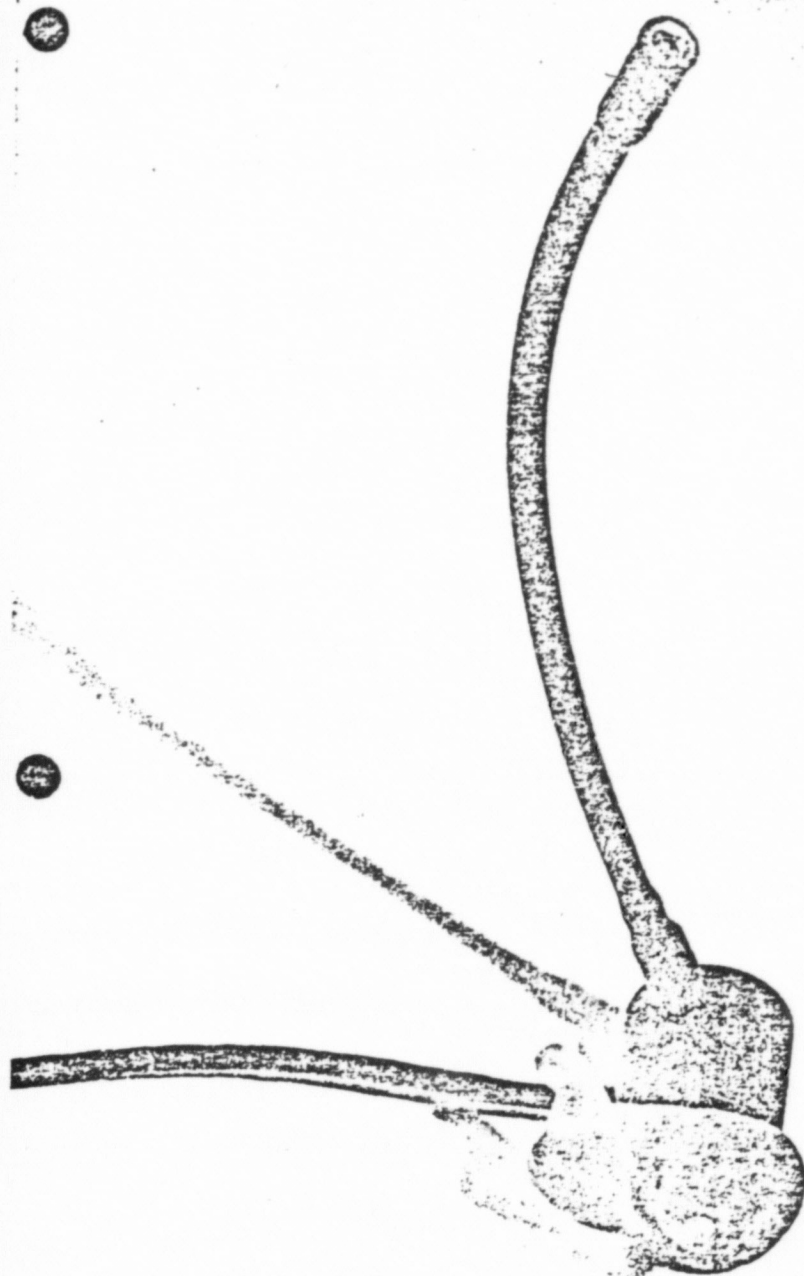


MS51 SELF-SUPPORTING  
EARPIECE-TYPE HEADSET.  
VIEW SHOWING SOUND PORT END

976

EP

4811



MS51 HEADSET SHOWN  
ATTACHED TO EARPIECE

EP	4812
----	------

977

#### IV. SUMMARY SHEET

- 1) Unit Designator: MS50
- 2) Description: Universal,  
Headband/Glasses-Bow Mounted
- 3) Date of Development:  
September, 1961
- 4) Design Conclusion:

The MS-50 configuration was developed simultaneously along with the models previously mentioned, and ultimately was selected as the concept that represented the most logical and acceptable headset evolution in the eyes of both the telephone industry and the general public.



415 A For Info  
11-11-65  
Audiotone

Telephone 242-1111  
Cable AUDIOT

division of ROYAL INDUSTRIES, INC.

2422 WEST HOLLY • PHOENIX 9, ARIZONA

September 8, 1964

Pacific Plantronics, Inc.  
Box 635  
Santa Cruz, California

Attention: Mr. Keith Larkin, President

Dear Mr. Larkin:

With reference to your request, I will submit herewith a brief review of the past business dealings between our companies.

In late 1961, PPI Representatives, Keith Larkin and Dick Palmer, contacted Audiotone regarding assistance in resolving technical engineering problems encountered which had halted development of a prototype miniature headset. Examination of the prototype by our Audiotone Engineering Staff showed this problem to be inherent in the design of the unit; i.e., principally the utilization of non-shocked mounted external type transducers which resulted in mechanical feedback and poor low frequency response not meeting F.A.A. specifications.

Audiotone fabricated a prototype using a basic design\* concept standard in our hearing aid line. This constitutes the basis of design subsequently employed in the PPI products.

Yours very truly,

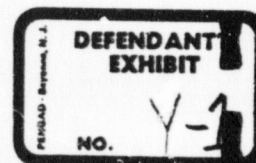
*Byron G. Langford*  
Byron G. Langford  
Vice President - Engineering

BGL:fs

Enclosure

\*Audiotone Drawing P1033-3, dated February 1, 1962.

979

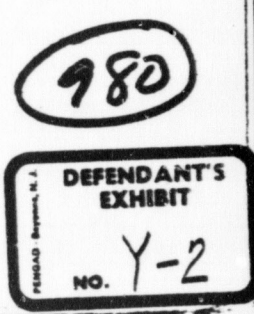


EP 005408

CHX

[illegible]

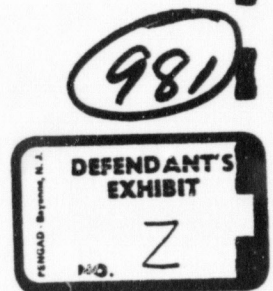
THE UNIVERSITY OF CHICAGO  
 DIVISION OF THE PHYSICAL SCIENCES  
 DEPARTMENT OF CHEMISTRY  
 5712 S. DICKINSON DRIVE  
 CHICAGO, ILL. 60637



Larkin Exhibit No. 10 For Identification  
11-6-73 RJ

THE USE OF ACOUSTICAL TUBES  
TO  
IMPROVE MICROPHONE PERFORMANCE

W. K. LARKIN and A. S. DENNIS. Ph.D.





## ABSTRACT

A new type of miniaturized microphone-headset combination (the Plantronics MS-50) is described. The outstanding feature of the unit is its use of an acoustical tube to transmit sound from the corner of the user's mouth to the microphone. This tube acts as an audio-frequency filter. By trial and error it has been found possible to make its characteristics compensate for deficiencies in the transducer microphone's frequency response, thus leading to greatly improved performance. A graph showing the frequency response of a production unit is presented; it is seen to meet Federal Aviation Agency specifications (amplitude variation < 12 db) over frequency range from 260 c/s to 4300 c/s.

### I. GENERAL DESCRIPTION OF MS-50 HEADSET-MICROPHONE

The Plantronic's Model MS-50 and all auxiliary parts are shown in Figure 1.

The MS-50 is an integral unit containing a miniaturized microphone and receiver in a single compact capsule. The capsule does not require power from an outside source. The capsule can be worn on either side attached either to the headband or to conventional prescription or sun-glass frames. An acoustical tube is used to convey sound from the corner of the user's mouth to the microphone. A standard earpiece is used to carry sound from the receiver unit to the ear.

For aircraft operation, the output of the microphone is fed into a 3-transistor preamplifier, which in turn is connected into the transmitting equipment ordinarily used with a carbon microphone. The preamplifier, although only 3 inches long (Figure 1), is designed for mounting on the airframe, preferably above and slightly behind the pilots. A single 3-wire cord runs from the capsule to the preamplifier while 2 cables connect the amplifier to the appropriate plugs, namely, those used to plug in the conventional microphone and the conventional headset receiver. The preamplifier is not used to modify incoming signals; this arrangement of jacks and cords is used because of its simplicity.

The final piece of equipment used in the MS-50 system is an oxygen mask adaptor. This is a mechanical microphone weighing less than 0.5 oz. It is mounted on the inner wall of the mask with a nipple extending through the wall and projecting outside. This device permits the use of the acoustical tube even when oxygen is being used. The end of the tube is merely slipped over the projecting nipple. Tests using this system have proven quite satisfactory, with almost complete elimination of the distortions frequently present in oxygen-mask microphones.

The "on-off" microphone switch of the MS-50 is mounted on the aircraft yoke. This eliminates the need for one-handed flying while making radio transmissions. The receiver unit is "on" at all times.

992

To sum up, the MS-50 is a miniature headset-boom microphone combination offering replacement of 3 bulky units in current use:

1. HS-33 type headset and cord
2. Hand microphone and cord
3. Oxygen-mask microphone, amplifier and cord

Its weight is approximately 1/12 that of the units which it replaces.

Further details concerning the MS-50 system are available from the manufacturer.<sup>1</sup>

## II. FREQUENCY RESPONSE OF SYSTEM

The central feature of the MS-50 system is its acoustical tube. The need for such a device is shown in Figure 2. This figure shows the frequency response of the transducer microphone alone, as measured in an Anechoic Chamber. The uneven response, particularly the poor performance below 1000 c/s, is readily apparent. The use of such a microphone without correction would involve serious loss of intelligibility.

Some improvement is possible through the use of trimming capacitors in the transistor preamplifier. This will serve to suppress the higher frequencies but cannot solve the basic problem, which is the lack of a flat response below 2000 c/s. As Figure 2 shows, the 12 db limit upon frequency response variation, as set by Federal Aviation Agency requirements, is satisfied only between 470 and 4200 c/s.

Figure 3 shows the frequency response of the same microphone with some trimming capacitance added to the output amplifier and the acoustical tube attached (Curve A), while the original response is shown by the dashed line (Curve B). The trimming capacitance serves to reduce the response at the high-frequency end of the spectrum. However, since the peak from which the variation is measured is itself cut down, the upper limit for the 12 db factor is not changed appreciably, holding in this case to 4050 c/s.

A more significant change, due to the presence of the tube, is the increased response at all frequencies from 165 to 440 c/s. This brings the lower response limit (12 db below the peak) down to 260 c/s. Interestingly enough, the tube serves to completely eliminate the response near 100 c/s; this effect was more noticeable for certain microphones which had greater responses down to around 100 c/s. The frequency response curve for the microphone with tube as shown by repeated trials, remains below the minimum detectable up to near 200 c/s and then rises sharply to the desired level. The value of this characteristic in eliminating low frequency interference is obvious.

<sup>1</sup>Plantronics, Inc., 111 Josephine Street, Santa Cruz, Calif.



### III. RELATIONSHIP OF RESPONSE CURVE TO TUBE CHARACTERISTICS

As noted in the abstract, the design of a suitable tube for the particular transducer microphone used was worked out empirically. No theoretical treatment of the problem has been given to date. Parameters which have been found to influence the frequency response include the tube's length, inside diameter and curvature, the material used and the size of the adaptor used to attach it to the capsule.

Figure 4(a) shows the response of an MS-50 microphone with a 9-3/4 inch straight tube attached but no trimming capacitor (Curve A), and the same microphone without a tube (B). Figure 4(b) shows the difference between the two as an amplification factor for the tube as a function of frequency. It is seen that the tube acts like an amplifier with several pass-bands of varying gain.

It might be thought at first glance that the pass-bands correspond to the resonant modes of the column of air in the tube. If this were true, the theoretical solution for a straight tube would be fairly simple, involving the application of appropriate boundary conditions to Laplace's Equation in cylindrical coordinates. However, the first peak detected for the 9.75" tube is at 275 c/s, where the wavelength of sound in air at standard temperature and pressure is near 4 ft., so something more complicated is at work.

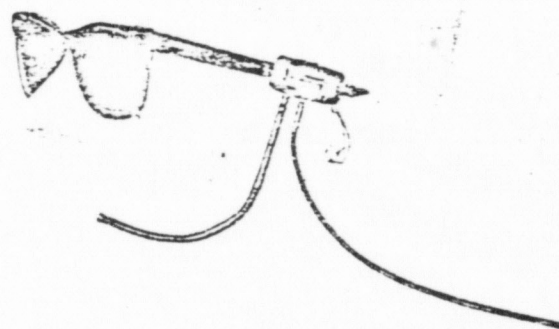
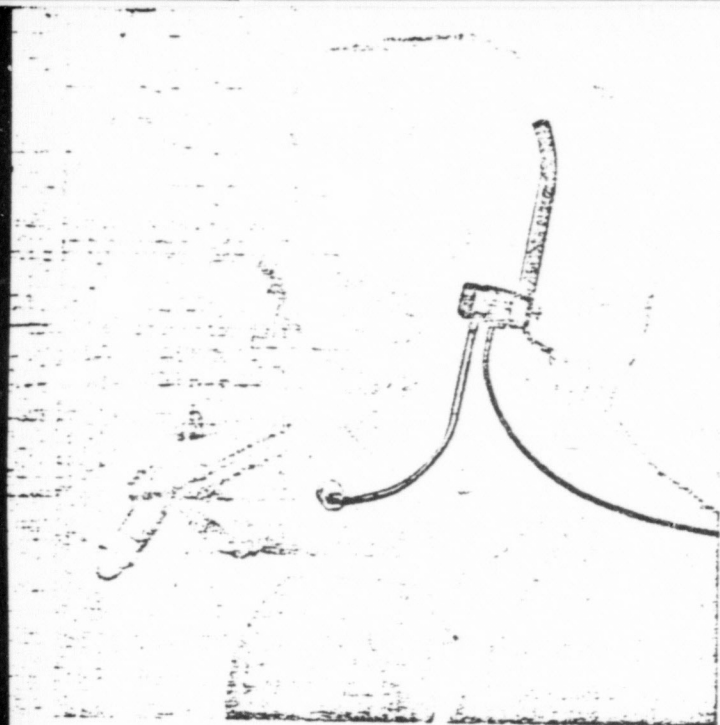
Tests have shown that the shaping of the mouth of the tube is important. In actual use the response depends somewhat upon the position and orientation of the end of the tube with respect to the pilot's mouth. This suggests a problem analogous to that of aperture illumination in microwave studies.

The bench tests indicate that the type of plastic used to make the tube is important. It is possible that some sound energy travels within the tube walls, leading to interference effects at the microphone end due to the different velocities of propagation involved.

It is apparent that acoustical tubes present a real challenge to the theoretician. An understanding of the physics involved could well lead not only to improvements in their characteristics, but to new devices employing similar principles of operation.

484





985

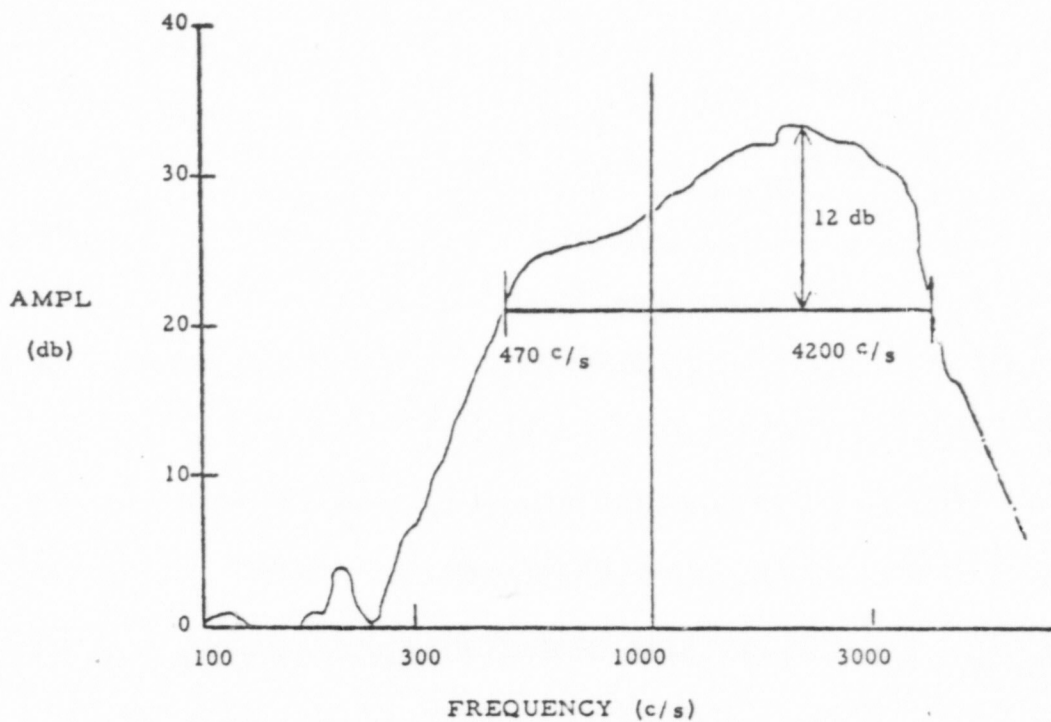


Figure 2. Frequency Response of Microphone of MS-50

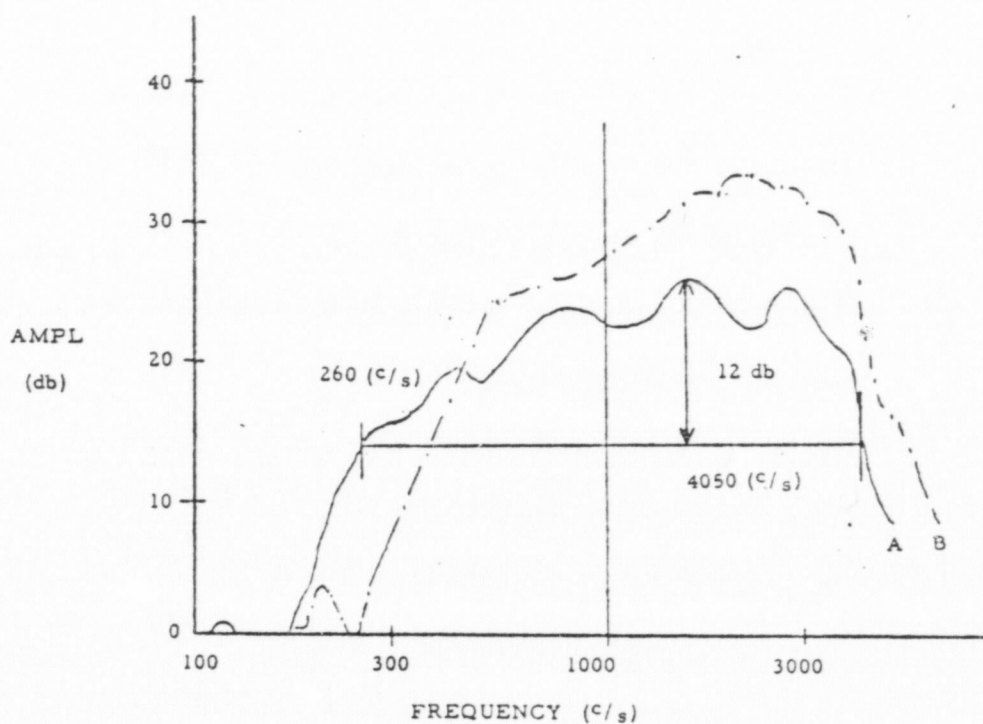


Figure 3. Frequency Response of MS-50  
Production Unit (A) and of Microphone Alone (B)

986

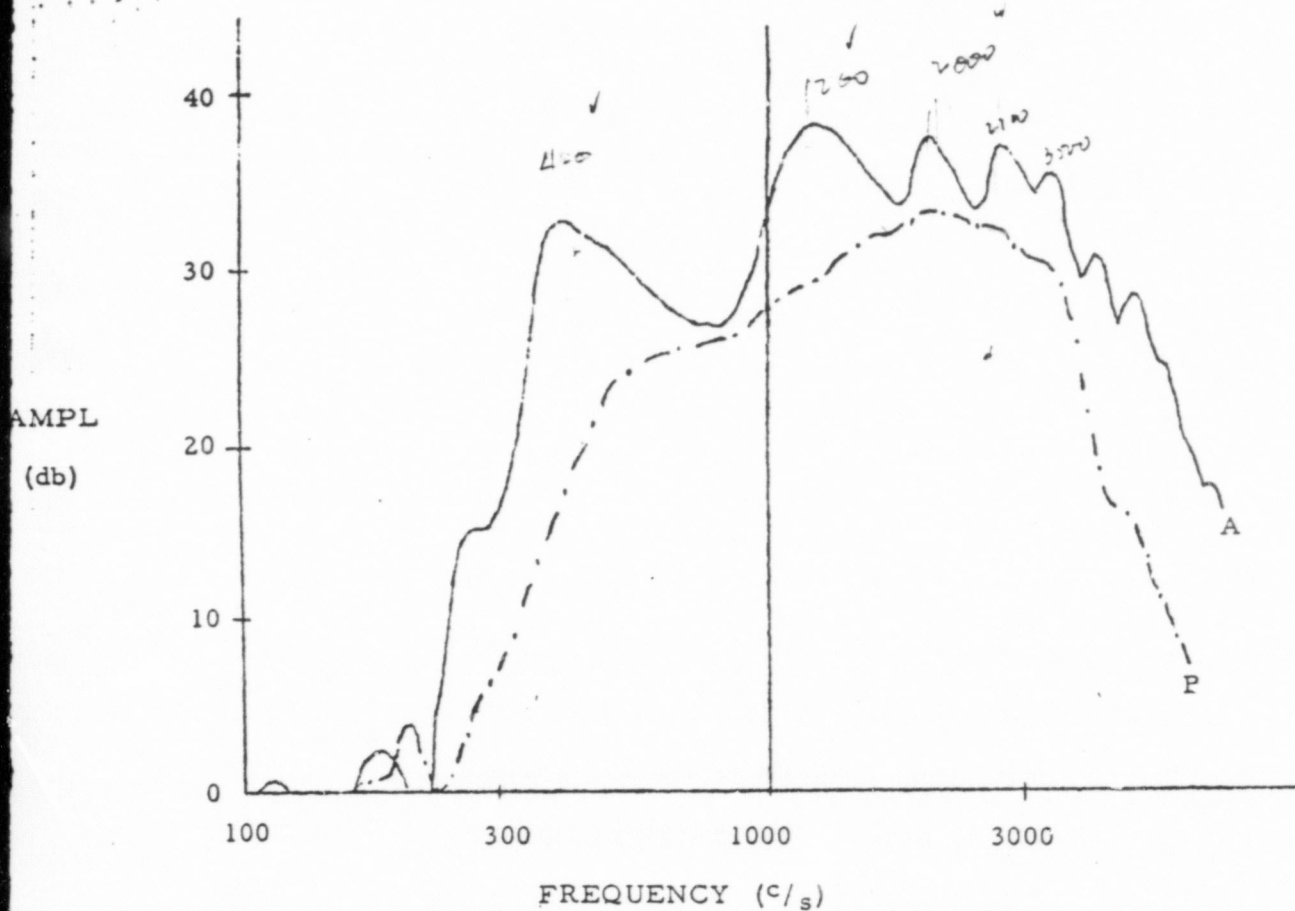


Figure 4(a). Frequency Response of MS-50 Microphone with Straight Acoustical Tube (A) and Without Tube (P)

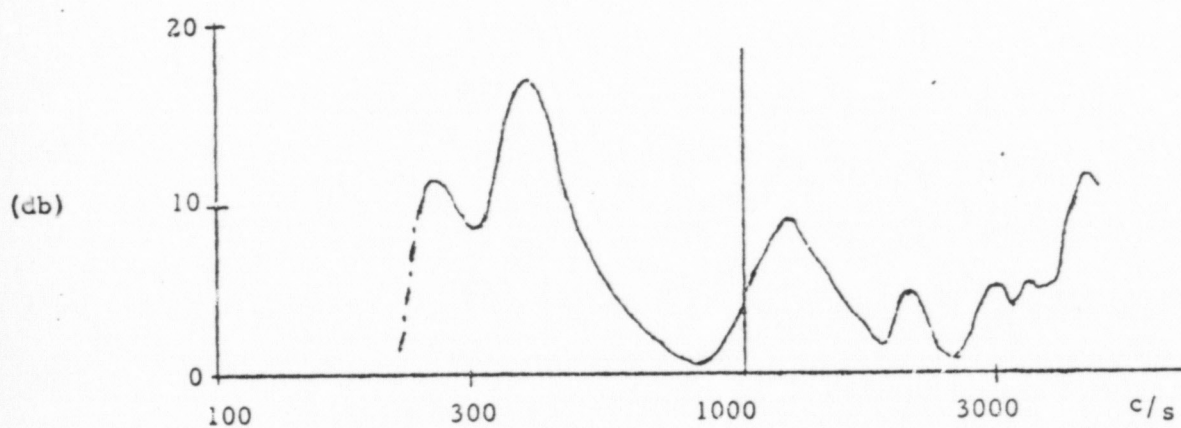


Figure 4(b). Amplification by Straight 9-3/4" Tube

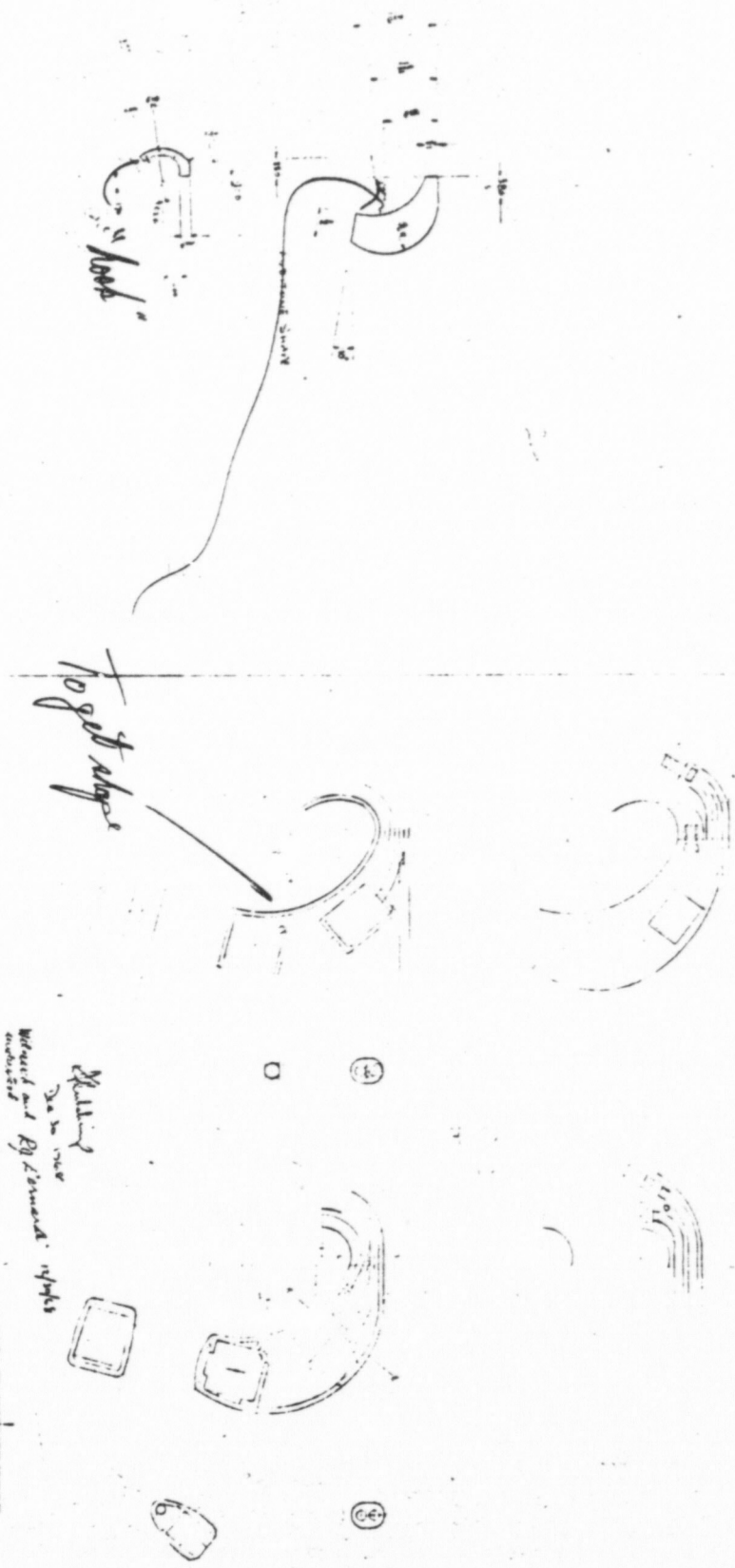
987



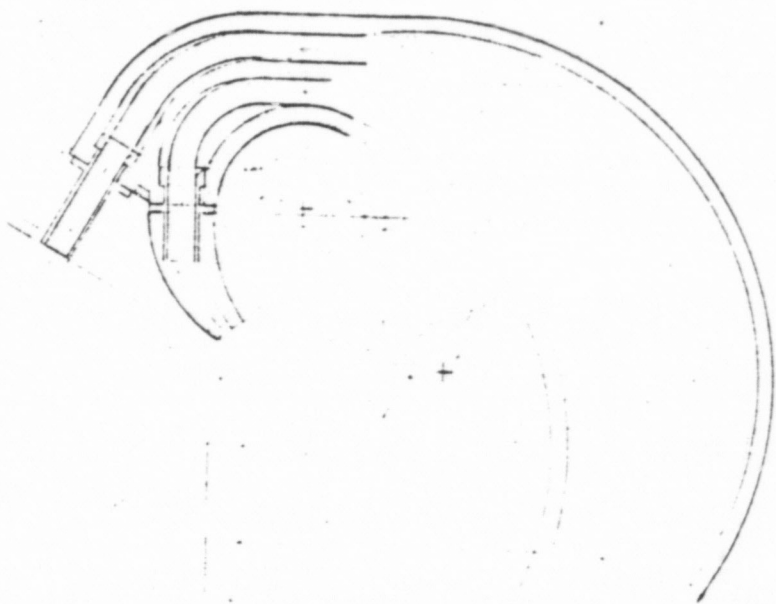
988

①

EP 2201



Shedding  
The new  
Wetland and R. Leonard. 19/10/10  
revised



Jan 2 1969 K. Hutchings  
Witnessed and understood R.J. Bernardi 1-2-69

EP 2179

989

2

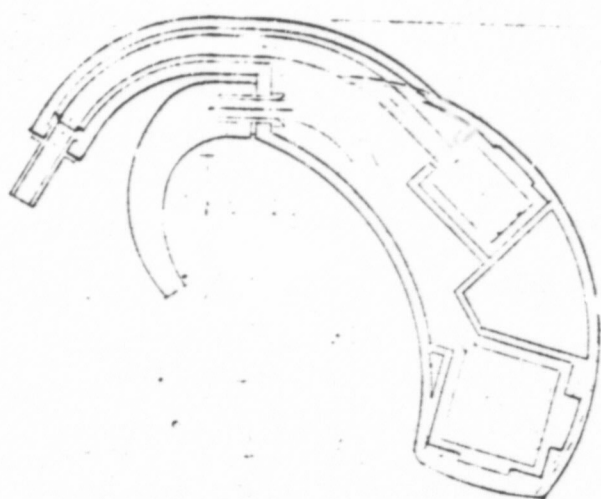
① Taser  
② Mtg.  
③ BG

"Tuber form" - m-1

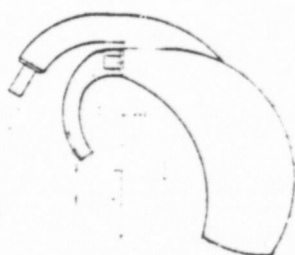
63125

Jan 13 - 1969

71



Jan 2 1969 K Hutchings  
Witnessed and understood R. J. Romani 1/2/69



EP 2161

990

3.



991

PART NUMBER

SOLID MODEL N°2

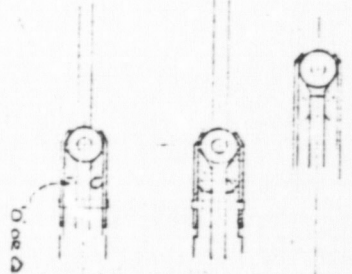
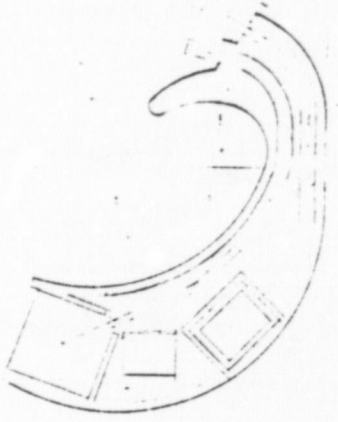
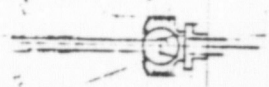
3

FRACTION DECIMAL

## MATERIAL

00110

00110

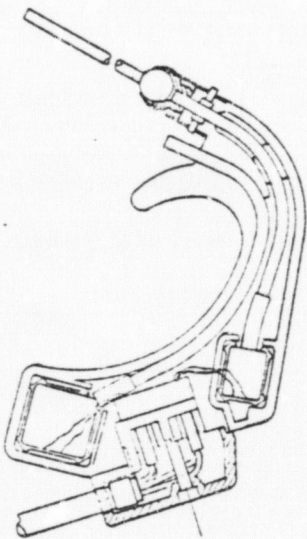


Plumbing  
1-10-69  
Widened and  
reworked E. Bonatti  
1-10-69  
One Quad Box

992

5.

EP 2178






ORIGINAL CONCEPT

EP 2177

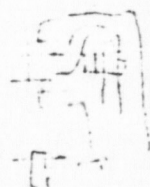
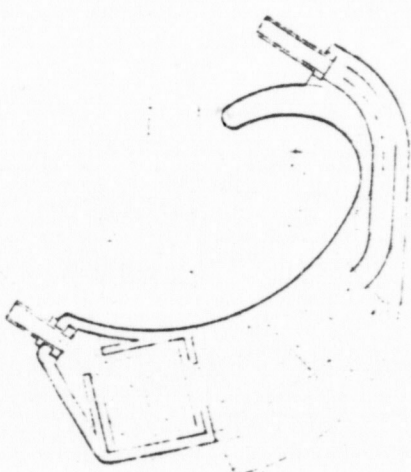
SOLID MODEL NO2 DWG NO 63185-2

DATED JAN 8 1969 & LAYOUTS DATED:

DEC 30 '68  
JAN 2 '69  
JAN 10 '69

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND TOLERANCES ARE:		DO NOT SCALE	 <b>PACIFIC PLANTRONICS, Inc.</b> SANTA CRUZ, CALIFORNIA
FRACTION	DECIMAL	ANGLE	
+	+	+	
MATERIAL			
Pt  HYPHERLONICS <sup>12</sup> / <sub>100</sub>		CONTRACT NO.	
C40			
AFR0			
AFR0			
SCALE		DATE	
SIZE 1 CALCODE 10441 DWG NO <b>C</b>		 <b>ALTERNATE MISBO</b> <b>DESIGN. (TRANSMITTER &amp; RECEIVER TUBES OVER EAR)</b>	
63185-86			
SCALE		DATE	





Jan 4 69  
W. Turner and R. B. Bennett  
and others  
1-4-69

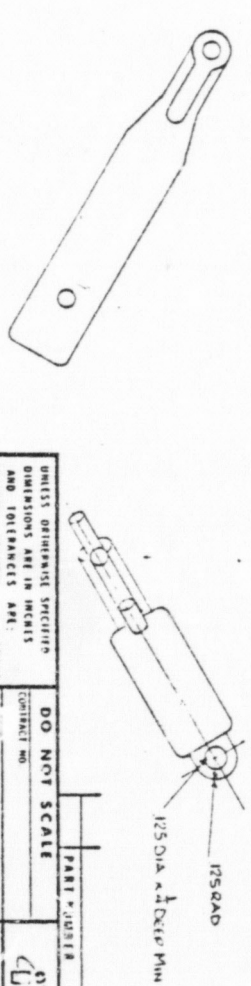
Ex. DD

994

1.

EP 2163

DESCRIPTION  
C/N DATE BY INFO



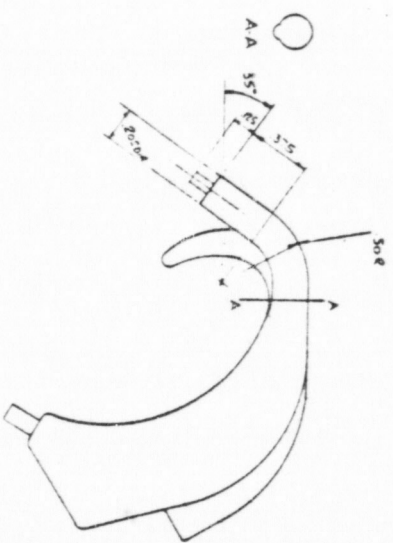
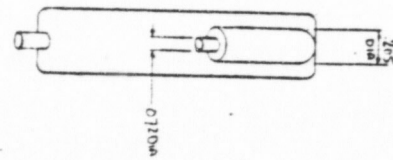
EP 2176

REVISION			
LIB	DESCRIPTION	DATE	BY

3.

946

FULL SIZE



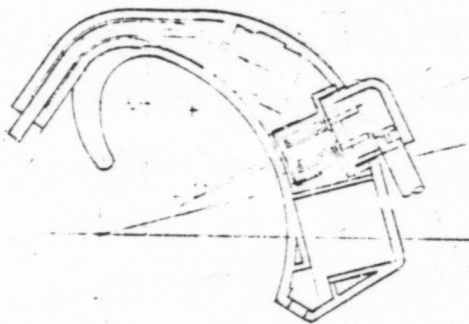
ALL OTHER DETAILS AS SOLID MODEL N° 3

EP 2174

DIMENSIONS NOT SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTION DECIMAL + - + - +		DO NOT SCALE CONTRACT NO.		PART NUMBER	
MATERIAL + - + - +		CRO 1/16"		TITLE SOLID MODEL N° 3	
SIZE C		DATE 6/18/54		DWG NO. 2174	

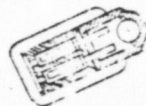
PACIFIC PLANTRONICS, Inc.  
SANTA CRUZ, CALIFORNIA





Sketching?  
1-18-69

Witnessed and understood  
R. J. Edwards 1-23-69



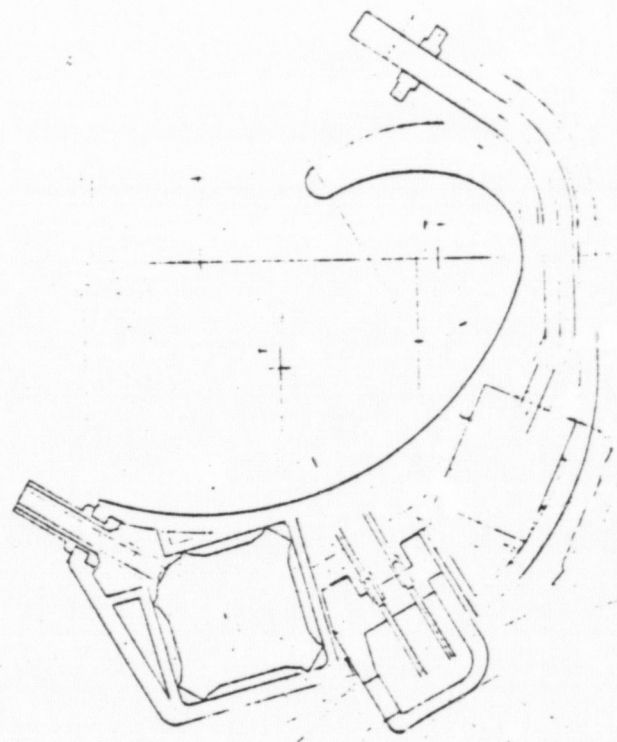
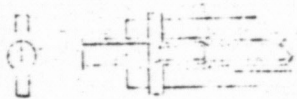
88

EP 2172

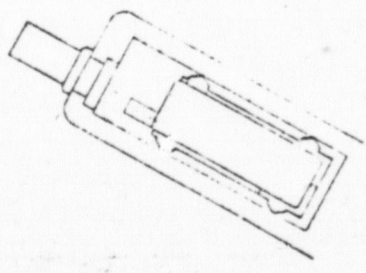
997

4





1-24-69  
 1-24-69  
 1-24-69  
 1-24-69

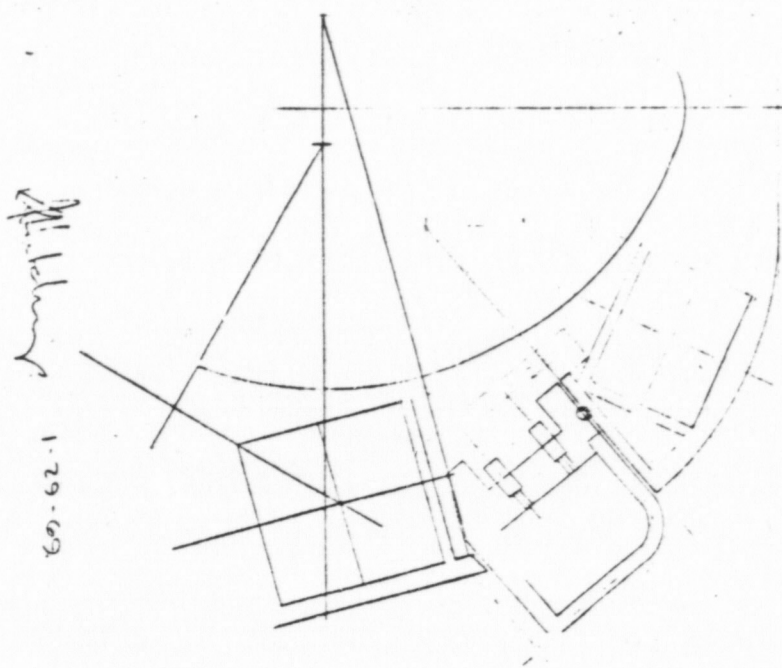


EP 2199

999

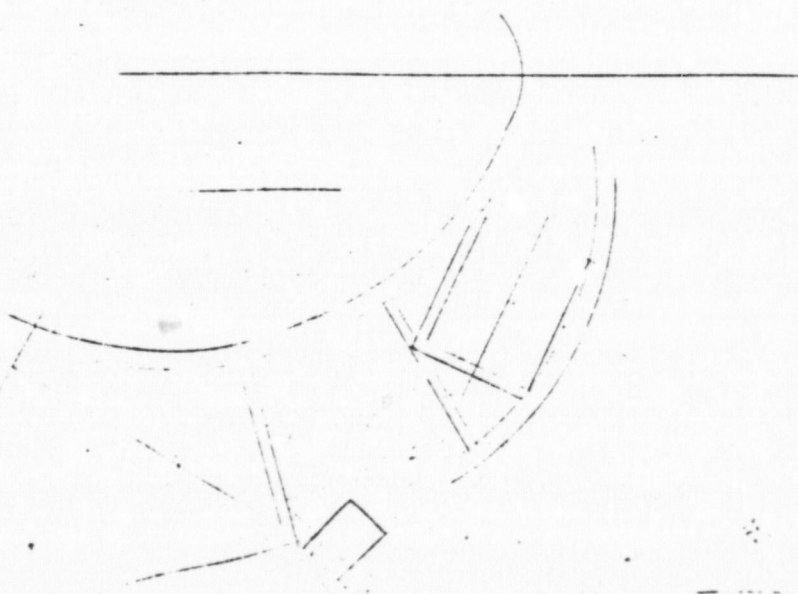
6





Sketching 1-29-69

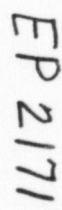
1-29-69



EP 2168

1000 (7.)

1001



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND TOLERANCES ARE:		DO NOT SCALE
FRACTION	DECIMAL	COURTESY NO.
ANGLE		
MATERIAL		DATE 1-29-62
		FILED
APP'D		
APP'D		
APP'D		





"Tube on form" - 1

Jan 13 - 1969.

63185  
MS 80 Headset.

① Task  
② Mtg.  
③ CPG  
What happened before?

Shape

Started work Tuesday Monday 23 December 1968 To layout concepts of a Post Amble Type headset.

Provisional layouts completed Dec 30 1968 indicated that a full size receiver and 1/2 size microphone would fit in the space and shape envisioned.  
(Receiver 831519 3002. Mic 831591 50002)

The concept of the mic & Receiver ports emanating from the top of the ear was pursued until Jan 2. 1969. The concept of the mic outlet over the ear and the receiver outlet under the ear was then evaluated and a layout completed Jan 4 1969. (63185-1)

A drawing for a solid model of a headset was drawn Jan 6 1969. The following the concept of mic over ear and receiver under ear. This model was completed 1/7/69 but was not correct in some of the details of shape over the ear. A second solid model of this shape was completed by 1-10-69 (63185-2)

A drawing for a solid model of a headset with mic & receiver outlet, both over the ear, was drawn Jan 8 1969 and a model completed by Jan 11-1969

Preliminary fitting of the first & second models to various people's head indicated that an angular adjustment of the acoustic tube would be necessary in a vertical and horizontal plane so various methods were laid out and sketches produced (63185-3) Jan 10 1969

EP 2312

1003

DEFENSE EXHIBIT NO. E

To produce a model of the ball joint concept for the acoustic tubes:-

Minnesota Rubber, (612-929-6781) Mr Wally Dahl was contacted for Sample O and quad rings 8004 & Q4004 respectively. These will be mailed Jan 14, 69. The only stock material is Buna-N. Thermometer.

Also contacted Pontas Seal Co 415-357-1900 and requested Sample O rings same size & material.

*[Signature]* 1-13-69.

Witnessed and Understood

*[Signature]* 1-13-69

Jan 13-1969.

The feasibility of a plug in capsule cable was commenced with discussion with Jendras on miniature plug & socket on Tuesday Jan 7 1969. AMP & Servo reps were in plant and samples were obtained for preliminary investigation of suitability.

Lay out work was commenced on the cable entry Jan 11 1969.

*[Signature]* 1-13-69

Witnessed and understood

R.J. Bernardi 1-20-69

EP 2311

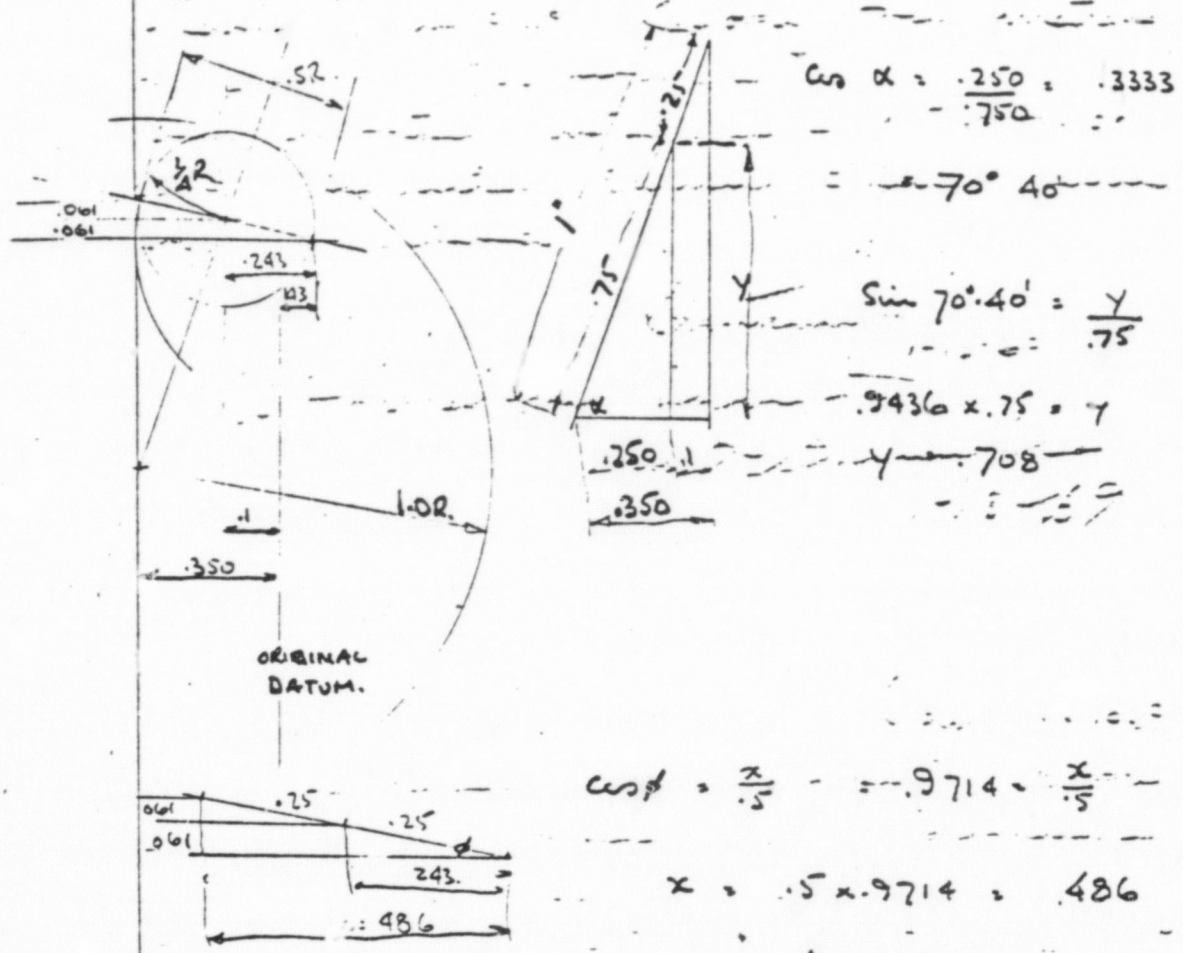
1004



1-14-69.

Decision made to permit the concept with  
inlet on east and east outlet under  
east.

To layout dimensions of shape of inside  
form.



Witnessed and understood, R. J. Bernardi 1-20-69  
1-18-69.

Main design effort since 1-14-69  
has been concentrated on providing  
a removable capsule cable. A method  
was devised which will probably be  
suitable for the <sup>initial</sup> models. It is not  
an ideal solution and it appears that  
V/I will have to work up for a  
method of our own design ~~method~~  
rather than attempt to use proprietary  
part.

EP-2310



1-18-69  
 measuring of subject wearing  
 solid model no. 1 has been provided.  
 This operation should be completed by  
 Monday Jan 20. From the data  
 obtained any change that are  
 required can be evaluated and  
 final layout for working model  
 can be started

K. J. Bernardi 1-18-69

Witnessed and understood, K. J. Bernardi 1-20-69

2-4-69  
 First working model of post auricle  
 headset completed 12 noon today

K. J. Bernardi

Witnessed and understood, K. J. Bernardi  
 2-4-69

Ep 2309

1006

MODEL 80 HEADSET

Notes of Engineering Meeting December 21, 1968

In attendance: Hutchings, Parker, Schaumberg, Bernardi

I. Examination of Hearing Aids

A. Types seen at Santa Cruz

1. Ear mold contained
2. In-the-ear
3. Post auricle
4. Bone conduction
5. Glasses frame
6. Cord type

B. Follow-up

1. Parker to visit hearing aid dealers in San Francisco.
2. Hutchings to pick up varieties of sleeves for in-the-ear aids ordered from Bappell.

II. Headset Configurations Considered

A. Post Auricle

1. Standard
2. Noise cancelling

B. Near-the-ear directional mic with ear insert.

C. Receiver with directional microphone in locket.

III. Next Activity on Headset

- A. Hutchings making layout of IIA.
- B. Bernardi making recordings to determine feasibility of IIB & IIC using directional mics.
- C. Find out cost of  $\frac{1}{4}$  size transducers
- D. Build 61A dummy model. *or get 61A from Bell.*
- E. Get 2 standard ear mold sets.

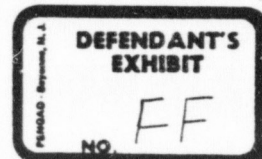
IV. Acoustic Tube Factors

- A. 61A type
- B. Pliable form-holding type
- C. Push-on replaceable
- D. Position in front with puff guard

1007

G798

EP 2412



EP-27

V. Amplifier

A. Type

1. T55
2. T56
3. 61A

B. Construction

1. Discrete
2. R-C package
3. Thick film

VI. Earpiece

A. Beaudry

B. Tapered tree - one size at to fit

C. Sigma Si Rubber tree, 2 sizes

D. Other hearing aid tips.

G-797.5  
EP2411

1008



DEFENDANT'S EXHIBIT II

- DX-II-1 Larkin British patent 1,009,818
- II-2 Larkin British Patents Form No. 1
- II-3 S.G. Brown Ltd. license dated February 5, 1965
- II-4 S.G. Brown Ltd. license dated July 1, 1968  
with Appendices A to D
- II-5 Letter dated August 12, 1964 to Keith Larkin
- II-6 Letter dated August 12, 1964 from Stevens, Langner  
to C.P. Graham
- II-7 Letter dated August 13, 1964 from V.H.A. Diederichs  
to Keith Larkin
- II-8 Letter dated August 18, 1964 from Keith Larkin to  
Stevens, Langner
- II-9 Letter dated September 9, 1964 from V.H.A. Diederichs  
to Keith Larkin
- II-10 Letter dated February 18, 1966 from A.H.S. Pickburn  
to Keith Larkin
- II-11 Letter dated March 25, 1966 from S.G. Spragens to  
Maurice Benavitch
- II-12 Letter dated March 25, 1966 from S.G. Spragens to  
Dr. M. Brent
- II-13 Letter dated March 29, 1966 to S.G. Spragens
- II-14 Letter dated April 1, 1966 from S.G. Spragens to  
A.H.S. Pickburn
- II-15 Letter dated October 6, 1967 from C.P. Graham to  
S.G. Brown Ltd.
- II-16 Letter dated February 14, 1968 from William B.  
Christy IV to Paul E. Homrighausen
- II-17 Letter dated September 25, 1970 from V.H.A. Diederichs  
to S.G. Spragens
- II-18 Letter dated October 16, 1970 from S.G. Spragens to  
Victor H.A. Diederichs
- II-19 Letter dated August 30, 1972 from S.G. Spragens to  
Victor H.A. Diederichs

1009

Ex. I

# PATENT SPECIFICATION

DRAWINGS ATTACHED

Inventor: WALLACE KEITH LARKIN

1009,818

1009,818



Date of Application and filing Complete Specification Aug. 25, 1964.

No. 34790/64.

Complete Specification Published Nov. 10, 1965.

© Crown Copyright 1965.

Index at acceptance:—H4 J(3A, 3F, 4B, 4D)

Int. Cl.:—H 04 r

## COMPLETE SPECIFICATION

### Improvements in or relating to Telephone Head-sets

We, PACIFIC PLANTRONICS INCORPORATED, a corporation organized and existing under the laws of the State of California, United States of America, of 111 Josephine Street, Santa Cruz, California, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to sound translating apparatus and particularly to miniaturized microphone head sets.

It is one object of the present invention to provide an improved sound translating apparatus adapted to be used with communications apparatus employed in vehicles such as aeroplanes, in which the pilot is sometimes required to wear a mask, such as an oxygen mask.

According to the invention, a miniaturized microphone head set employing a microphone and receiver comprises the combination of means for detachably supporting the microphone and receiver adjacent to the wearer's ear, a first acoustical tube, means for attaching one end of said first tube to said microphone, the other end of said first tube being adapted to be positioned adjacent to the wearer's mouth, a second acoustical tube, and means for attaching one end of said first tube to said microphone, the other end of said first tube being adapted to be positioned adjacent to the wearer's mouth, a second acoustical tube, and means for attaching one end of said second tube to said receiver, the other end of said second tube being adapted to be plugged into the wearer's ear.

The invention is particularly suited to the use of very small microphones and receivers of the kind often described as "miniature".

The invention will now be described, by

[Price 4s. 6d.]

way of example, with reference to the accompanying drawings, in which:

Figure 1 illustrates a miniaturized microphone head set employed in combination with an oxygen or smoke mask such as is provided to airline pilots, navigators and other personnel having communications responsibilities;

Figure 2 illustrates the head set employed by the communications apparatus operator or pilot after removal of the mask;

Figure 3 is a sectional view taken along the line 3—3 of Figure 1;

Figure 4 is a side view of the fitting provided for supporting the microphone and receiver of the head set;

Figure 5 is a sectional view taken along the line 5—5 of Figure 4;

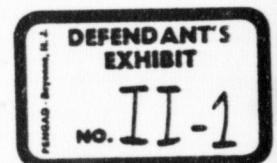
Figure 6 is a detailed view showing the manner in which the fitting shown in Figures 4 and 5 is supported on the temple bar of the wearer's eyeglass frame, a portion of the temple bar being shown in broken lines;

Figure 7 is an end view of the fitting shown in Figures 4, 5 and 6; and

Figure 8 is a schematic view of the pilot's and co-pilot's compartment in an aircraft showing the manner in which this invention is adapted to be used.

Referring to the drawings, a small fitting 10, which may be made of metal or plastics material, is provided for the purpose of supporting a miniature microphone and a miniature telephone receiver or other sound translating apparatus or transducers on the temple bar 11 of the eyeglass frame worn by the operator or pilot. A spring clip device 12, such as shown in Figures 5, 6, and 7, is provided for this purpose. The clip 12 is shaped so that the end portions 13 and 14 thereof form hooks which clip over one side of the temple bar 11, as illustrated by the

1010





hook 14 shown in Figure 7, and the middle part 15 of this spring clip is bent back upon itself as shown in Figure 6 to form an opposing hook adapted to be clipped over the other side of the temple bar 11, also as shown in Figure 7.

The fitting 10 is provided with a button member 17 which extends from the inner side of this fitting and which is provided with a keystone shaped portion 17a that is anchored in a suitable cavity in the fitting 10 by means of the cement, plastic or other potting material 18 as shown in Figure 5. The projecting portion of this button 17 is provided with a circumferential groove in which the arcuate portions 15 and 16 of the clip member 12 are adapted to be resiliently lodged as shown in Figures 5 and 6. Thus the fitting 10 may be detachably attached to the temple bar 11 and it may also be detached from the clip member 12 if desired.

The fitting 10 is also provided with additional cavities for receiving the transducers 19 and 20 which comprise the microphone and receiver of a communications apparatus such as is employed by the pilot and co-pilot of an aircraft. These devices 19 and 20 are positioned in their respective cavities in the fitting 10 and they are held therein by a thin layer of plastic, cement, or potting material 21 and 22 respectively. Both the microphone 19 and receiver 20 are of the miniature type such as are used in hearing aids.

The microphone 19 is provided with a short tubular extension 23 which is hollow, and to which the cap 24 is adapted to be attached. Thus the projection 23 extends into the cavity 25 of the cap 24 so that sound transmitted through the plastic or other flexible tube 26 and tubular connection 27 into the cavity 25 passes through the hollow extension 23 into the microphone 19. A suitable flexible or resilient gasket 23a may be provided between the cap 24 and the extension or projection 23 of the microphone and this gasket is preferably sufficiently flexible or resilient to hold the cap 24 assembled on the microphone and also to permit the cap 24 to be rotated with respect to the microphone 19.

The receiver 20 is also provided with a hollow extension or projection similar to the projection 23 of the microphone 19 so that sound generated in the receiver 20 may be readily passed into the cavity of the cap 28 which is similar to the cap 24. The ear tube 29 is attached to the cap 28 by means of the coupling member 30 so that the sound from the cavity of the cap 28 is passed through this ear tube 29 into the operator's ear.

The plastic tube 26 is made of yieldable material which may be formed into predetermined shape so that the lower end thereof may be placed either in the fitting 31 of the

mechanical microphone that is supported on one side of the oxygen mask, as shown in Figure 1, or this lower part of the plastic tube 26 may be positioned at the corner of the operator's mouth, as shown in Figure 2, when the operator does not wear the oxygen mask. The mechanical microphone unit positioned in the mask is intended to eliminate the conventional electrical microphone, which is now an integral part of the oxygen and smoke masks used in military and commercial jet aircraft.

The fitting 31, in which the lower end of tube 26 is positioned, is shown in cross-section in Figure 3 and it is threaded to the tubular hollow member 32 to which the lower end of the plastic tube 26 is adapted to be frictionally attached. The mask is made up of an outer body member 33 which may be made of relatively rigid material and an inner lining 34 of resilient material such as rubber. The tubular member 32 extends through both of these layers 33 and 34, as shown in Figure 3, and is integral with the diaphragm housing member 35 of the mechanical microphone so that one side of this member is clamped against the resilient liner 34 of the mask when the fitting 31 is tightened up against the outer mask member 33. The tubular member 32 is provided with a hollow channel 36 which communicates with the compartment 37 behind the diaphragm 38 and it also communicates with the channel through the plastic tube 26. A diaphragm 38 is held in the member 35 on the shoulder 35a by the cap 39 which is provided with an inner annular member that is adapted to engage the peripheral outer part of the diaphragm and press this diaphragm against the shoulder 35a. Cap 39 is also provided with an outer annular portion 39b which is threaded to the outside of the diaphragm housing 35.

A number of holes 40 are also provided to the central portion of the cap 39 so that sound may readily enter the inside of this cap to impinge upon the diaphragm 38. Thus sound vibrations impinge upon the diaphragm 38 and vibrate the air column extending all the way from the inner surface of the diaphragm 38 to the surface of the diaphragm (not shown) in microphone 19. The air column starting in the microphone cavity 25 and passing through fitting 27, plastic tube 26 and tubular member 32, which opens into the diaphragm cavity 37 of the mechanical microphone provides acoustic tuning to the miniature type microphone and alters mechanically the frequency response of the microphone. The tube 26 is preferably made of irradiated polyolefin plastic, such as polypropylene, and the desired acoustic tuning for the miniature microphone is accomplished by controlling the length, diameter and wall thickness of this tube. The tuned acoustical system is used with the miniature microphone for the specific

1011



purpose of removing a series of inherent deficiencies due to the miniature size of these microphones, which have previously precluded their use in general audio communication applications.

Thus the tuned acoustical tube in this invention functions substantially to remove certain objectionable frequencies or bands of frequencies prominent in background noise in any specific environment and it also functions to alter the primary frequency response curve of the microphone, particularly in the lower spectrum, to allow use of the miniature microphone in areas of voice communication, such as aircraft, switchboard and teaching machines where space and weight savings are important.

In some installations, it may be desirable to provide a small opening from cavity 37 to the exterior through the wall of the housing 35 so that air pressure therein may be equalized to the air pressure in the smoke mask, or oxygen mask. This small opening, however, should not be so large as to compare in cross-section with the cross-sectional area of the passage 36.

One of the advantages of this invention is that the microphone 19 and receiver 20 may be worn on either side of the operator's head.

Thus the pilot sitting in seat 41 in the aircraft pilot's compartment, shown in Figure 8, may wear the microphone and receiver on his right hand side of his head and the spring clip 12 that is provided for attaching the fitting 10 to the temple bar 11 is constructed so that this fitting may be attached either to the right hand temple bar or to the left hand temple bar as desired. Also the cap 24 for the microphone and cap 28 for the receiver are adapted to rotate with respect to these elements so that the plastic tubes 26 and 29 attached thereto may be positioned at the desired angles with respect to the fitting 10. Thus the pilot occupying seat 41 has the electrical connections 44 from his microphone and receiver connected to the communication apparatus coupling box 42 which is attached to the fuselage of the aircraft, and the co-pilot occupying the seat 42 being provided with a microphone and receiver attachment on the left hand side of his head has the electrical connections 45 thereto coupled to the coupling box 43 of the communications apparatus.

#### WHAT WE CLAIM IS:—

1. A miniaturized microphone head set employing a microphone and a receiver, com-

prising the combination of means for detachably supporting the microphone and receiver adjacent to the wearer's ear, a first acoustical tube, means for attaching one end of said first tube to said microphone, the other end of said first tube being adapted to be positioned adjacent to the wearer's mouth, a second acoustical tube, and means for attaching one end of said second tube to said receiver, the other end of said second tube being adapted to be plugged into the wearer's ear.

2. A miniaturized microphone head set as claimed in claim 1, wherein the first acoustical tube is of plastics material, yieldable, and adapted to be formed to a predetermined shape so that said other end of the tube can be positioned adjacent to the wearer's mouth.

3. A miniaturized microphone head set as claimed in claim 2, wherein the first acoustical tube is of polyolefin plastic.

4. A miniaturized microphone head set as claimed in claim 3, wherein the first acoustic tube is of polypropylene.

5. A miniaturized microphone head set as claimed in any one of claims 1 to 4, including a diaphragm supported in an oxygen or smoke mask, said diaphragm having means for attaching said other end of the first tube thereto.

6. A miniaturized microphone head set as claimed in any one of claims 1 to 5, wherein the means for detachably supporting the microphone and receiver adjacent to the wearer's ear comprise clip means adapted to be attached either to the right or left temple bar of the wearer's eye glasses.

7. A miniaturized microphone head set as claimed in any one of claims 1 to 5, wherein the means for detachably supporting the microphone and receiver adjacent to the wearer's ear comprise a member having cavities for receiving said microphone and said receiver, a resilient clip, means for attaching said clip to said member, said clip having means for resiliently gripping the temple bar of the wearer's eyeglasses frame so that the microphone and receiver are supported adjacent to the wearer's ear.

8. A miniaturized microphone head set substantially as herein described with reference to the accompanying drawings.

STEVENS, LANGNER, PARRY &  
ROLLINSON,  
Chartered Patent Agents,  
Agents for the Applicants.

1012

Fig. 1.

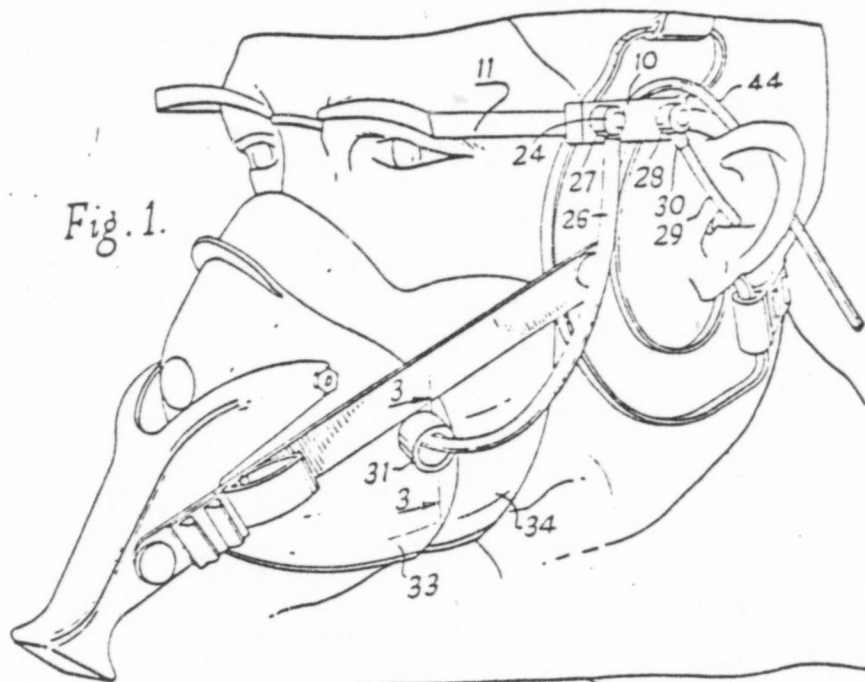
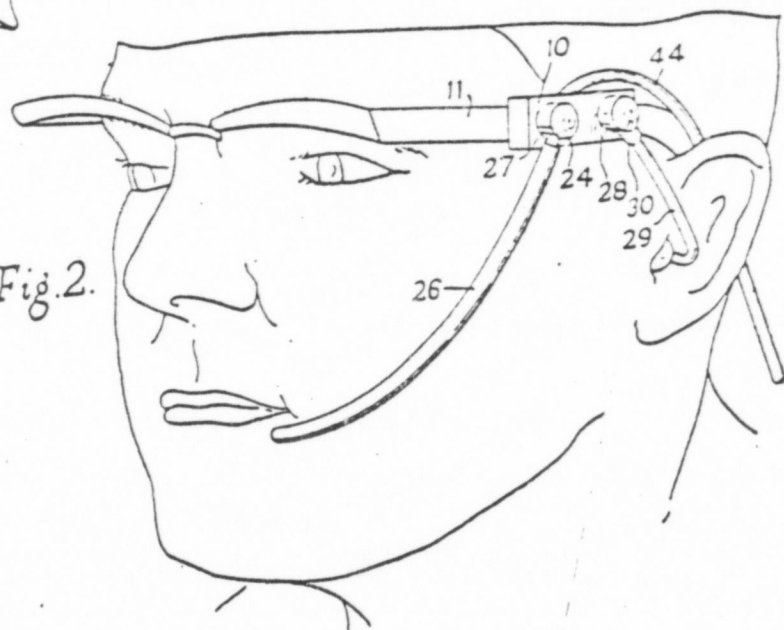
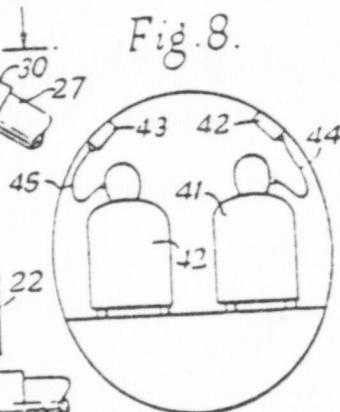
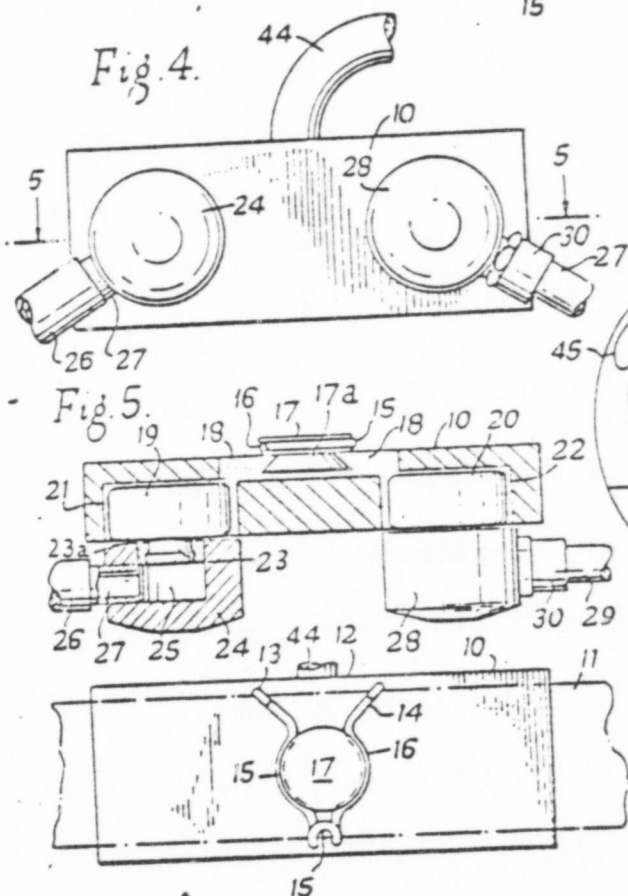
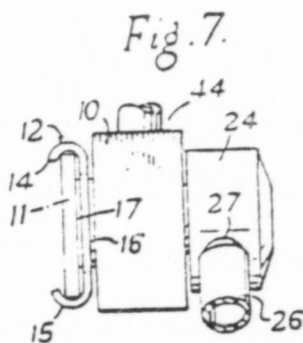
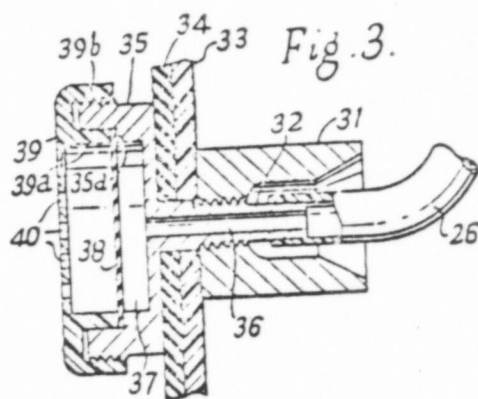


Fig. 2.



1013



1014



25 AUG 1964

1974 25 AUG 1964

Larkin Exhibit #23  
11-7-73 MM

34790  
1964

1009818

GPO/2524

PATENTS FORM No. 1.

PATENTS ACTS, 1949 and 1957.

COMPLETE

34790

APPLICATION FOR PATENT.

[To be accompanied by two copies of Patents Form No. 2  
or of Patents Form No. 3.]

NOTE—This is a comprehensive form, and parts inappropriate to a particular application should be cancelled. In the case of an application by the inventor, only Sections 1, 4, and 6 of this form are appropriate, and Section 5 if a Patent of Addition is applied for.

(a) Insert (in full name,  
address and nationality  
of applicant).

1. -I-(We) (a) PACIFIC ELECTRONICS INCORPORATED  
of 111 Josephine Street, Santa Cruz, California,  
United States of America, a corporation organized and existing  
under the laws of the State of California, United States of  
America,

(are) in possession of an invention which is described in the

accompanying (b) provisional  
complete specification, under the title:

(c) "Improvements in or relating to telephone head-sets"

(a) Delete the words  
which are not applicable.

(a) Insert the title of  
invention.

(a) Insert name of in-  
ventor(s) if included at (a).

(b) I  
We  
The said (d)

claim(s) to be the true and first inventor(s) of the invention.

or

2. -I-(We) believe (c) WILLIAM KELLY DODD, a citizen of  
the United States of America, of 111 Josephine Street, Santa Cruz,  
California, United States of America,

to be the true and first inventor(s) of the invention

(b) I  
we PACIFIC ELECTRONICS LIMITED  
the said

(b) are the (b) assigner(s) of the said inventor(s) in respect of the  
right to make this application.  
(personal representatives) of the said inventor(s).

EP 005699

DEFENDANT  
EXHIBIT

NO. II-1

1015

The invention or a part of the invention was communicated to

(b) { me  
us  
the said

(f) Insert in full name  
address and nationality of  
communicator.

by (f)

Use of the invention  
in the United Kingdom  
before the date of the app-  
lication for a patent is a  
lawful ground of ob-  
jection.

4. -I (We) declare that to the best of my (our) knowledge and belief the statements made above are correct and there is no lawful ground of objection to the grant of a patent to me (us) on this application, and I (we) pray that a patent may be granted to me (us) for the said invention.

5. And I (we) request that the patent may be granted as a patent of Addition to (b) { patent No. \_\_\_\_\_  
the patent to be granted on application No. \_\_\_\_\_

6. And I (we) request that all notices, requisitions and communications relating to this application may be sent to:-

STEVENS, LANGNER, PARRY & ROLLINSON,

at (g) Quality House, 5-9 Quality Court,  
Chancery Lane, London, W.C.2.

(g) The address must be  
within the United King-  
dom.

(h) Delete if not applic-  
able.

(i) To be signed by appli-  
cant(s).

(h) who are hereby appointed to act for me (us).

(i) For Patent Application, Inc.  
President

Declaration to be signed by anyone named as inventor who is not an applicant.

I (We) assent to the making of this application and of any divisional applications resulting therefrom.

Walter Scott Land

To the Comptroller.

The Patent Office.

25, Southampton Buildings,  
Chancery Lane, London, W.C.2.

#### NOTICE TO INVENTORS.

Attention of applicants is drawn to the desirability of avoiding publication of inventions relating to any article, material or device intended or adapted for use in war (Official Secrets Acts 1911 and 1920).

In such cases, after an application for a patent has been filed at the Patent Office, the Comptroller will consider whether publication or communication of the invention should be prohibited or restricted under Section 18 of the Act and will inform the applicant if such prohibition is necessary. Applicants are reminded that under the provision of this Section applications may not be filed abroad without written permit or unless an application has been filed not less than six weeks previously in the United Kingdom for a patent for the same invention and no direction prohibiting publication or communication has been given.

1016

A N A G R E E M E N T made the F I F T H day of

F E B R U A R Y one thousand nine hundred and sixty five  
BETWEEN PACIFIC PLANTRONICS INCORPORATED whose place of  
business is situate at P.O. Box 635, Santa Cruz California  
United States of America (hereinafter called "P.P.I." which  
expression will include its successors and assigns of the one  
part and S.F. BROWN LIMITED a Limited Liability Company registered  
under the laws of Great Britain whose registered office is situate  
at Shakespeare Street Watford in the County of Hertford  
England (hereinafter called "S.G.B." of the other part (which  
expression will include its successors and assigns).

WHEREAS

P.P.I. is the registered proprietor of patent applications  
particulars of which are set out in Part I of the First  
Schedule to this Agreement in respect of Plantronics Audio  
Gear based upon Plantronics Type MS-50 hereinafter called  
the Equipment.

AND

P.P.I. has agreed to grant and S.G.B. is willing to take  
exclusive licence to manufacture and have manufactured and  
sell rent or hire the equipment in the following countries,  
Great Britain France Italy Belgium Germany and Holland  
for which P.P.I. will on signing this Agreement seek patent  
coverage,

AND FURTHER

P.P.I. acknowledges willingness and intent to expand this  
agreement to include additional areas (excluding U.S.A. and  
Canada) by specific name at such time as S.G.B. may indicate  
positive intent to actively pursue a marketing program of  
subject products offering mutual benefit to both S.G.B. and P.P.I.

NOW IT IS HEREBY AGREED AS FOLLOWS

- (1) P.P.I. will grant and S.G.B. will take exclusive licence  
to manufacture use sell rent or hire in the countries  
specified the equipment under their patents set out in  
Schedule I and patents to be applied for under Clause 2  
of this Agreement for the term of five years from the  
date hereof subject to the terms and options contained  
in this clause and clauses 9 and 10 of this Agreement.

Should such patents be defeated S.G.B. will have the right  
to cancel this Agreement by giving thirty days notice to  
P.P.I. at their registered address.

S.G.B. agree not to dispute the validity of any patents  
obtained by P.P.I. relating to the equipment during the  
term of this Agreement.

DEFENDANT  
EXHIBIT

NO. II-

6920

EP 007566

1077



- (2)A P.P.I. undertakes within a period of four weeks from the execution of this Agreement to supply S.G.B. with all technical knowledge and manufacturing information and know-how which is additional to that contained in the said patents and as may be reasonably required by S.G.B.
- (2)B P.P.I. and S.G.B. will forthwith communicate each to the other any improvement that they may make on the equipment whether or not such improvement is patented.
- (3) P.P.I. will permit senior personnel of S.G.B. to visit their works and will arrange with sub-contractors for such visits to their places of manufacture to study the design and manufacture of the equipment or parts thereof. The duration and frequency of such visits will be kept within reasonable limits and it is agreed that S.G.B. will pay all travel accommodation and other expenses incurred by their personnel in connection with such visits.
- (4) Should S.G.B. request P.P.I. will supply acoustical tubes and capsule 4-conductor wire at a price not in excess of \$1.18 and \$.24 per ft. respectively. These prices will be maintained for a period of eighteen months from signature of this Agreement and any variation thereafter will only be in accordance with increases or decreases in manufacturing costs.
- (5) S.G.B. will during the continuance of this Agreement pay to P.P.I. on the First day of January and the First day of July in every year a royalty equivalent to five per cent of the ex. factory selling price (after deduction of trade discounts and commissions allowed to S.G.B. distributors and sales agents) of the patented articles manufactured and sold by or on behalf of S.G.B. during the preceding six months the first of such payments to be made on the First day of July 1965, provided always that no royalty will be payable on parts obtained from or through P.P.I. On sales by S.G.B. to International Telephone & Telegraph or General Telephone & Electronics International, S.G.B. will pay P.P.I. a sales commission of three-and-one-half per cent over and above the basic royalty due P.P.I.
- (6) Minimum royalties will be payable by S.G.B. at the rate of \$2,000 U.S. (Two thousand U.S. dollars) per year starting on the First day of July 1966.
- (7) S.G.B. will pay P.P.I. the sum of \$6,000 U.S. (Six thousand U.S. dollars) for such papers and articles to be delivered pursuant to Clause 2 of this Agreement, which will be paid upon receipt of such papers and articles.

6921  
EP 007567

1018

- (8) P.P.I. agrees to indemnify S.G.B. against all claims (including legal costs but not including any loss of use or loss of profit) arising out of any allegation by a third party of patent infringement by the equipment provided that S.G.B. will forthwith give notice to P.P.I. in writing of any such claim and will take no action which might prejudice the interests of P.P.I. in the conduct of resulting proceeding by such third party.
- (9) P.P.I. may by notice to S.G.B. forthwith terminate this Agreement if royalties shall at any time be in arrear or unpaid for three calendar months after same shall have become due and payable unless such payment is prohibited by law.
- (10) S.G.B. will have the right by notice given not less than twelve months before the expiry of this Agreement to be granted an extension for a further period of five years.
- (11) Any notice required or authorised to be given by any party hereunder to the other may be served by prepaid letter or sent through the post to the registered office of the other party and it shall operate and be deemed to have been served at the expiration of three weeks from the date on which it was dispatched and proof of such dispatch shall be sufficient evidence of service.

Signed for and on behalf of  
PACIFIC PLANTRONICS INCORPORATED

Signed for and on behalf of  
S. G. BROWN LIMITED

*[Signature]*

*[Signature]*  
Secretary

6922

EP 007568

## L I C E N S I N G   A G R E E M E N T

THIS AGREEMENT, dated as of the first day of July, 1968, by and between PACIFIC PLANTRONICS, INC., a California corporation (hereinafter referred to as "PPI"), and S. G. BROWN, LIMITED, a limited liability company, registered under the laws of England (hereinafter referred to as "SGB").

### W I T N E S S E T H:

WHEREAS, PPI has developed, manufactured and marketed a line of commercially accepted microphone-headset products in several configurations, has obtained certain letters patent covering specific proprietary features utilized in these products, and has applied for other letters patent (such patents and patent applications being listed on Appendix A attached), and has accumulated a considerable body of proprietary technical, production, and marketing knowledge related to these products; and

WHEREAS, during prior periods of time PPI has furnished SGB and SGB has acquired from PPI certain knowledge and rights pertaining to such headsets, including sample products, technical support, and assistance in developing the markets for said headsets; and

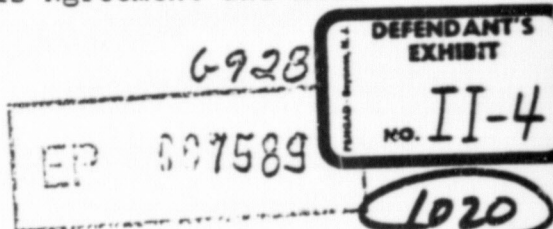
WHEREAS, SGB desires the right to manufacture and sell the Licensed Products, as hereinafter defined, and to make use of aforementioned knowledge and rights of PPI as hereinafter provided.

NOW, THEREFORE, in consideration of the premises and mutual covenants contained herein, the parties hereto as follows:

#### 1. Definitions

This section defines words and terms which will be used repeatedly in the Agreement, such as.

(a) "Headsets" means the model or models of PPI headset products covered by this Agreement, as referred to in Appendix B attached. Appendix B may be amended from time to time by written mutual agreement of PPI and SGB, such amendments to effect a change in the definition of "Headsets" and of any terms used in this Agreement which are inclusive of "Headsets" as of the date specified therein. Any such amendments shall be physically attached to this Agreement and made a part hereof.





(b) "Assembly Parts" means assembly parts, sub-assemblies and components designed for use or actually used as original equipment in Headsets.

(c) "Replacement Parts" means all parts, sub-assemblies, and components (other than Assembly Parts) designed for use or actually used in Headsets.

(d) "Licensed Products" means, Headsets, Assembly Parts and Replacement Parts.

(e) "Manufacturing and Commercial Data" means all information in written or graphic form pertaining to the manufacture and sale of Licensed Products which is now or hereafter developed, owned or acquired by PPI during the term of the Agreement, which PPI has the right to disclose to SGB.

(f) "Manufacturing Services" means all functions now or hereafter performed by or in behalf of PPI pertaining to the manufacture of Licensed Products which PPI has the right to provide to SGB, including, but not limited to, engineering, designing, manufacturing, assembling, packaging, testing, raw material purchasing, control of raw material and finished inventory of any or all of the Licensed Products.

(g) "Commercial Services" means all functions now or hereafter performed by or in behalf of PPI pertaining to the marketing and distribution of Licensed Products which PPI has the right to provide to SGB, including, but not limited to, distributing, selling, promoting, advertising, financing, servicing, and maintaining all or any Licensed Products.

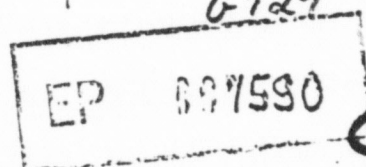
(h) "Technical Information" means all data, services, and other information available to SGB from Manufacturing and Commercial Data, Manufacturing Services, and Commercial Services in written, graphic, or oral form, including any inventions embodied in any patents or patent applications covering Licensed Products which are now or hereafter developed, owned, or acquired by PPI during the term of the Agreement, which PPI has the right to disclose to SGB.

## 2. Rights Granted

PPI grants to SGB for the term of the Agreement:

### (a) Manufacturing Rights:

PPI hereby grants SGB during the life of this Agreement the exclusive, nontransferable right to manufacture the Licensed Products in Great Britain (hereafter called the



"Manufacturing Territory"), and, except as provided for under paragraph 3(a) below, the right to have Licensed Products manufactured for it only in Great Britain, and the right to use only in Great Britain, the Technical Information for manufacturing purposes.

(b) Authority to Sell and Distribute:

PPI hereby grants SGB during the life of this Agreement, the nontransferable right to sell and distribute either directly or through agents Licensed Products in those countries or territories listed in Appendix C attached (hereinafter called "Licensed Territory"), including the right to use only in the Licensed Territory the Technical Information for sales purposes.

(c) Authority to Export:

The right to export Licensed Products outside the Licensed Territory may be granted to SGB by PPI on an individual transaction basis, and SGB agrees not to export Licensed Products outside the Licensed Territory without prior written approval from PPI. It is recognized that such approvals by PPI may be subject to official authorizations by agencies of the U. S. Government.

3. Limitations

During the term of the Agreement:

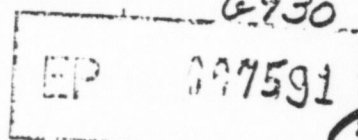
(a) SGB has no license or right to manufacture, assemble, or to have manufactured or assembled Licensed Products outside of the Manufacturing Territory, except that subcontractors outside of the Manufacturing Territory can be used where supply or economic conditions necessitate, subject to approval by PPI.

(b) SGB has no license or right to sell, rent or lease Licensed Products outside of the Licensed Territory except as provided in Sections 2(c) (Export) and 5. (Sale to PPI or its designated Licensees).

(c) SGB has no license or right with respect to any other PPI product other than Licensed Products.

(d) SGB has no right to sublicense or to assign its rights under the Agreement.

(e) SGB will not sell or distribute any equipment which utilizes the accoustical tube principle and weighs less than six (6) ounces, except as manufactured by SGB or purchased



1222



from PPI as is designated pursuant to this Agreement. SGB's Helmet Transducer model/code number 5C.301/1, Skullcap Microphone/Receiver model/Code Number 5c.403/1 and Industrial Helmet Microphone/Receiver model number 5c.500/1 and improvements relating specifically thereto are exempt from this restriction.

(f) PPI is not precluded from making sales, in or for use in the Licensed Territory of any Licensed Products, to the United States Government or any agency thereof, or to any international agency or organization of which the U.S.A. is a member or which is substantially financed by the United States Government. PPI shall endeavor to arrange for any such purchaser to take delivery through SGB so it may earn a servicing fee.

#### 4. Technical Assistance

(a) PPI shall furnish SGB such Manufacturing and Commercial Data and Commercial Services as PPI considers necessary to assist SGB to establish its distribution and marketing programs for the Licensed Products. When requested by SGB in accordance with Section 4(d), these may include PPI sending a qualified technician, sales engineer, or other specialists for such periods of time as shall be reasonably necessary.

(b) At such time as SGB decides to enter into the manufacture of individual models of the Licensed Products not already in production, it will so advise PPI and PPI will furnish SGB within three (3) months thereafter such Manufacturing and Commercial Data and Manufacturing Services as PPI considers necessary to assist SGB to establish a manufacturing operation and commence production of Licensed Products. This will include a complete set of reproducible transparencies or vellums and specifications of the Licensed Products. Manufacturing Services may include PPI sending a qualified engineer, technician, or other specialists for such periods of time as shall be reasonably necessary and when requested by SGB in accordance with Section 4(d).

(c) When PPI sends specialists to the Licensed Territory as provided in Sections 4(a) and 4(b), PPI will bill SGB who will pay within thirty (30) days after receipt of such billing, PPI's costs of sending such personnel, including, but not limited to, salaries (including fringe benefits), economy/tourist class transportation, living and commercial expenses for such personnel, plus a service fee of five per cent (5%) of all such costs.

(d) If SGB wishes PPI to provide engineering services, such as preparation of technical studies, engineering drawings, etc., PPI shall endeavor to provide such services, but at PPI's



option and convenience. PPI will bill and SGB will pay within thirty (30) days after receipt of such billing, PPI's costs of providing such services, including, but not limited to, salaries (including fringe benefits), of personnel working on the services, materials, costs of economy/tourist class transportation required in rendering the services, living and commercial expenses required by the services, costs of outside services used by PPI, plus a service fee of ten per cent (10%) of all such costs.

(e) SGB can send sales engineers to PPI headquarters for the purpose of receiving Technical Information pertaining to the sales and distribution of Licensed Products. Similarly, when SGB has advised PPI of its decision to initiate manufacture as provided in Section 4(b), SGB can send production engineers to PPI headquarters for purpose of receiving Technical Information pertaining to manufacture of the Licensed Products.

(f) All expenses of sending SGB personnel to PPI headquarters shall be borne by SGB.

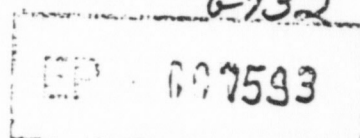
(g) SGB shall indemnify against, defend and save PPI harmless from and against any and all claims, suits, damages, etc., resulting from injuries or death of any SGB employee visiting PPI pursuant to the Agreement. PPI shall indemnify against, defend and save SGB harmless from and against any and all claims, suits, damages, etc., resulting from injuries or death of any PPI employee visiting SGB pursuant to the Agreement.

(h) As part of the Commercial Services, PPI will supply SGB three (3) copies of all current catalogs and literature and a copy of all future brochures, photographs (glossy copies) and other publicity and advertising materials pertaining to the Licensed Products within thirty (30) days of market release by PPI within the U.S.A. SGB may obtain additional copies from PPI for PPI's cost of supplying the additional copies.

##### 5. Supply of Licensed Products

(a) SGB agrees to buy from PPI or its designated licensee all of its requirements for models of Headsets which are not currently manufactured by SGB under this Agreement, and PPI agrees to supply, subject to availability, all requests from SGB for Headsets.

(b) Licensed Products supplied to SGB by PPI will be priced at an amount not greater than PPI's factory manufacturing cost plus twenty-five per cent (25%) of these amounts. Factory manufacturing cost is defined to include direct material incorporated in the product, productive labor directly applied



1024

to the product, indirect manufacturing expense, and any royalty payments which PPI must pay to third persons in order to manufacture the product. Factory manufacturing cost is defined to exclude selling, administrative and general expenses. All prices will be FOB factory of origin.

(c) PPI can buy such Licensed Products as SGB has available for sale. Such Licensed Products will be priced to PPI, FOB SGB's factory at an amount not greater than SGB's factory manufacturing cost plus twenty-five per cent (25%) of these amounts. The same definition included in Section 5(b) above will apply.

(d) PPI reserves the right to assign orders for headsets received from SGB under this agreement for manufacture and shipment by one of its licensees, and SGB agrees to accept delivery of such headsets so long as they comply with PPI's basic product specifications and the terms of this Agreement. PPI agrees to keep SGB fully informed of its current licenses and the products so licensed.

(e) Licensed Products sold by PPI to SGB under this Agreement will carry PPI's standard Warranty as granted to its U.S. customers. For the purpose of determining Warranty coverage, time periods will be extended an additional thirty (30) days to provide for shipping transit time. A copy of PPI's current Warranty agreement is attached as Appendix D to this Agreement.

#### 6. Manufacture of Licensed Products

(a) SGB shall, subject only to the requirements of its customers regarding minor modifications, manufacture Licensed Products substantially in accordance with the designs, specifications and other information supplied to it by PPI, and shall be responsible for using its best efforts to produce units substantially equivalent to those of PPI with respect to materials, workmanship and performance. SGB shall mail a sample of each new or significantly modified product manufactured by it to PPI, and shall permit PPI at reasonable times to enter SGB's premises for the purpose of inspecting units manufactured under terms of this Agreement.

(b) SGB will furnish PPI with copies of all top assembly or general arrangement drawings, specifications and other technical data prepared by or for SGB pertaining to Licensed Products. Such data shall be cross-referenced with drawing number, page reference, etc., used by PPI for the Licensed Product involved.



(c) Except as provided in paragraph 10(f) of this Agreement, SGB shall indemnify, defend and hold PPI harmless from any and all costs, liabilities, damages and other obligations arising from its manufacture of the Licensed Products.

#### 7. Rights From Others

(a) The rights and licenses granted by PPI to SGB include any right that PPI has or may acquire under license from another person that is needed by SGB to manufacture and sell Licensed Products, if PPI's license from the third party permits PPI to grant such right to SGB without additional charge.

(b) PPI shall endeavor to obtain for SGB or to assist SGB to obtain rights held by other persons and desired by SGB which PPI is not permitted to grant to Licensee without additional cost. PPI shall not pay for such rights except at SGB's written request and expense. Such costs including any additional royalty required to be paid by PPI shall be borne by SGB.

(c) If such rights cannot be obtained at a cost considered reasonable by PPI, SGB shall be permitted to use a substitute approved by PPI and, at SGB's expense, PPI shall cooperate with SGB in developing such substitute in the Manufacturing Territory.

#### 8. Improvements

(a) PPI shall inform SGB of any modification to Licensed Products when modification is put into use as a proven design and adopted as standard. Technical Information on the modification will be furnished to SGB, who will adopt the modification as quickly as practical.

(b) SGB shall inform PPI of any major modification it wishes to make and will furnish PPI such Technical Information as required by PPI to consider approval of the modification.

#### 9. Guarantees

(a) PPI will use best efforts to have Technical Information accurate but if it contains errors or omissions, PPI's only obligation is to use best efforts to correct them.

(b) If either party wishes to buy Licensed Products from the other, the supplying party agrees to furnish such Licensed Products with normal delivery and warranty and in keeping with Section 5.

(c) SGB will limit use and dissemination of Technical Information furnished by PPI as may be required by United States Government Regulations about which PPI will keep SGB informed.



10. Developments by PPI and SGB

(a) PPI will supply SGB with copies of all existing U.S. patents and patent applications pertaining to the Licensed Products within thirty (30) days after the Agreement becomes effective.

(b) When PPI applies for a patent in the U.S.A. pertaining to the Licensed Products, it will send a copy of the patent application to SGB within six weeks after the application date. If SGB so requests within six months thereafter, PPI will file patent application covering the design, etc. in such countries of the Licensed Territory as SGB designates and at SGB's expense. PPI will have ownership and title to patent applications and patents so filed.

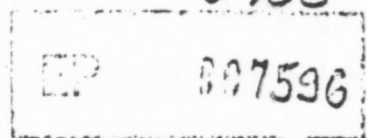
(c) SGB shall bear all expenses and do all things necessary to maintain and keep in effect the patents and patent applications in countries in the Licensed Territory coming within this Agreement and will furnish PPI with receipts for all expenses paid.

(d) If such application is made for a patent or patents in countries in the Licensed Territory, such application and any patent issued thereafter are included in the License granted under the Agreement.

(e) SGB will inform PPI of any action bearing on the rights covered by the Agreement. SGB shall not, directly or indirectly, during the term of this Agreement or thereafter, contest or aid others to contest anywhere the validity of any rights as to which a license is granted under the Agreement.

(f) PPI shall indemnify SGB against all claims (including legal costs but not including any loss of use or loss of profit) arising out of any allegation by a third party of patent infringement by the Licensed Products provided that SGB will forthwith give notice to PPI in writing of any such claim and will take no action which might prejudice the interests of PPI in the conduct of resulting proceeding by such third party.

(g) If SGB makes any invention, development or improvement of or applicable to Licensed Products or Technical Information (hereinafter called "SGB's Technical Data"), it will furnish PPI all data necessary for incorporation of SGB's Technical Data. SGB hereby grants to PPI the option to obtain an exclusive license to commercialize SGB's Technical Data and (for the term thereof) any patents deriving therefrom in any country where PPI, or any firm or person operating under rights granted by PPI, is manufacturing or selling Licensed Products,



provided, however, that any such license shall not be deemed to preclude SGB from utilizing such Technical Data or patents within the Manufacturing or Licensed Territory. PPI will have 120 days from receipt of notice from SGB in which to exercise its option. All licenses requested by PPI under provisions of this Agreement will provide for royalty payments of five per cent (5%) to SGB, with royalties determined on the basis defined in paragraph 12(a)(3) of this Agreement.

(h) If SGB applies for a patent on any of SGB's Technical Data in any country in the Licensed Territory, it will send PPI a copy of the patent application within six (6) weeks of the application date. If PPI requests within six (6) months thereafter, SGB will apply for the issue of a corresponding patent or patents in any country which PPI specifies, other than a country in the Licensed Territory. PPI will bear the expenses of any such patent applications or patents issued as a result thereof. SGB will have ownership and title to patent applications and patents so filed, subject to the license granted pursuant to 10(g) above.

(i) SGB will cause all applications, assignments and documents necessary to carry out the provisions of this paragraph 10 to be duly executed.

#### 11. Commercial Exploitation

(a) SGB will conduct marketing activities and maintain a properly equipped and qualified sales and service organization as required to secure maximum sales of Licensed Products in its markets in the Licensed Territory including those suggested by PPI. SGB will use whatever type and number of distribution outlets as will be most productive of sales.

(b) SGB will establish its own sales policies, conditions and prices, and will keep PPI fully and promptly informed of changes in such matters.

#### 12. Payments

(a) SGB shall pay PPI the following:

1. A payment of four thousand dollars (\$4,000) upon signing of this Agreement. PPI agrees that payment of this amount fully relieves any royalty obligations of SGB and PPI under any prior agreement, and each party hereby releases the other party from any and all other obligations, claims, or rights pertaining to any prior agreement.

2. A payment of five thousand dollars (\$5,000) to partially reimburse PPI for cost of a professional survey of the European market, and consulting services associated with



development of a marketing plan for the UK and Europe upon signing this Agreement.

3. A royalty of five per cent (5%) of the net selling price or the equivalent when the Licensed Products are rented or leased of all Licensed Products manufactured and sold, rented or leased by SGB, or any affiliate of SGB. Net selling price is defined as follows:

Gross selling price of Licensed Products  
billed to customers (invoice amount)  
Less

- (1) Sales, use, excise, or other taxes not paid by SGB's customers (but not taxes based on inventory value or income).
- (2) Freight, insurance and other transportation charges not paid by SGB's customers.
- (3) Returns and allowances of Licensed Products.
- (4) The actual cost to SGB (including incoming freight and duties) of all Assembly Parts and Replacement Parts purchased from PPI.

Licensed Products purchased from PPI for resale and not for use in manufacturing by SGB are not subject to royalty payments.

4. Minimum royalty payments for any six month period dating from the effective date of the Agreement will amount to one thousand dollars (\$1,000).

(b) The payments provided hereintofores shall be net of any taxes imposed by any taxing body except the U.S. Government.

(c) SGB will instruct its bank to remit payment for royalties due to PPI within thirty (30) days after the following dates: December 31, (commencing December 31, 1968) and June 30, (commencing June 30, 1969). Confirming copies of these instructions will be forwarded by air mail to PPI.

(d) Payments shall be made in U.S. \$ to PPI at the address indicated in Section 18(g), using the official rate of exchange on the day on which payment instructions are issued to SGB's bank.

(e) When making payment, SGB will furnish PPI with a report of sales made during the period, including information on markets served, major accounts and models, as reasonably requested by PPI.



S. G. BROWN LTD

(f) PPI, at its own cost, may request an audit by SGB's independent auditors of the books and records of SGB as necessary to verify the calculations and amounts of payments.

(g) In the event that governmental regulations may at any time preclude the payment of amounts due under this Agreement in U.S. currency, SGB shall, on the dates specified herein, pay the amounts due in its national currency to a bank selected by PPI for the account of PPI. If payment in U.S. currency, or equivalent in a major currency acceptable on a world-wide basis, is so precluded for a period of six months, PPI may terminate this Agreement at any time during such period of preclusion upon ten (10) days' notice.

### 13. Identification of Licensed Products

(a) SGB will identify Licensed Products made by SGB to indicate clearly that they were manufactured by SGB under License from PPI. PPI will advise the location, style and manner of such indications.

(b) PPI grants SGB permission to use "PPI", "Plantronics", and "Pacific" only on Licensed Products traded by SGB within the Licensed Territory; provided, however, that SGB will use reasonable care to insure that such use is made only in a manner which will not result in the loss of PPI's proprietary rights in such names.

(c) PPI will advise SGB of location, style, and manner in which said names are to be displayed and SGB will use said names only as specified.

(d) SGB agrees that during and after the term of this Agreement, it will not put to issue the validity or ownership of said names nor to do anything that will impair their validity and ownership.

(e) SGB will not during or after the Agreement use or register any name or trade style identical or similar to said names without written permission of PPI.

(f) SGB will not use said names on any products manufactured by it other than Licensed Products and will not use said names as part of its corporate or assumed business name.

(g) Nothing in the Agreement gives SGB any rights to said names, nor will SGB claim that its use under this Agreement has created any interest, etc., except that in the event this Agreement is terminated prior to its basic period SGB shall have a reasonable period of time to continue use of said names in order to utilize existing promotional materials and inventories.

(h) The permission granted to SGB to use said names is personal and shall not be assigned, conveyed or pledged in whole or in part without PPI's written consent.

#### 14. Secrecy

(a) Both parties will take all appropriate steps to safeguard Technical Information which will be treated as strictly confidential, and shall take suitable steps to prevent improper use of Technical Information by their employees.

(b) SGB shall have prior written consent of PPI before communicating any Technical Information which is clearly marked "Confidential" to third parties (including subcontractors) other than its employees. SGB will never use any of the Technical Information in connection with any product other than Licensed Products. Information contained in product or promotional literature, or in application and service data and the like, which is generally disseminated by PPI and information which is in the public domain will be excluded from this restriction.

#### 15. Duration of Agreement

(a) The Agreement shall be for a term of five (5) years from the date of this Agreement and shall extend thereafter from year to year subject to termination as hereinafter provided.

(b) Either party may terminate the Agreement at the end of the initial five (5) year term, by giving the other party notice of termination in writing on or before four (4) years from date of the effective date of the Agreement.

(c) After the initial five (5) year term, the Agreement will continue from year to year subject to either party terminating the Agreement as of any anniversary date thereafter by giving the other party notice of termination in writing at least one (1) year prior to the anniversary date on which the termination will be effective.

(d) PPI may terminate the Agreement at any time by giving notice in writing if any one or more of the following occur:

(1) SGB is declared bankrupt or makes an assignment for the benefit of its creditors, or goes into liquidation or receivership, in which case it must advise PPI immediately.

(2) SGB discontinues sale of Licensed Products for a period of greater than 120 days, or otherwise discontinues sale in an obvious manner.

(3) SGB fails to perform any of its promises under the Agreement and does not cure such breach within sixty (60) days of notice thereof from PPI.

(4) Any substantial change in the ownership of SGB, excepting by merger or transfer within the Hawker Siddeley Group, Ltd., or its successors.

(5) SGB fails to remit to PPI the minimum royalty payments defined under paragraph 12(a)(4).

(e) SGB may terminate the Agreement at any time by giving notice in writing if any one or more of the following occur:

(1) PPI is declared bankrupt or makes an assignment for the benefit of its creditors, or goes into liquidation or receivership, in which case it must notify SGB immediately.

(2) PPI discontinues sale of Licensed Products for a period of greater than 120 days, or otherwise discontinues sale in an obvious manner.

(3) PPI fails to perform any of its promises under the Agreement and does not cure such breach within sixty (60) days of notice thereof from SGB.

(f) If SGB or PPI terminates the Agreement under the provisions hereof, SGB will not, directly or indirectly, enter into the manufacture or sale of any of the Licensed Products or direct copies or direct derivations thereof in the Licensed Territory, or in any area of the world in which PPI, or a firm or person operating under rights granted by PPI, is then selling the Licensed Products, for three (3) years from the date of termination.

#### 16. Force Majeure

Neither party shall be liable for damages for any delay or default caused by Force Majeure, such as wars, strikes, etc., except that such Force Majeure does not relieve SGB from obligation to make payment provided in Section 12.

#### 17. Reports

SGB will furnish PPI the following reports at the times indicated:

(a) A copy of the Hawker Siddeley annual statement, within a reasonable time after its issuance.



(b) By the first of each calendar year or other twelve-month period which SGB uses for sales purposes, a business program for the Licensed Products for the forthcoming year including budgets and sales forecasts for each market in each country in the Licensed Territory.

(c) Such other reports and data relevant to this Agreement as PPI reasonably may request from time to time.

#### 18. Miscellaneous Provisions

(a) The Agreement is binding upon and will inure to benefits of the successors and assigns of both parties except SGB may not assign any right or obligation under the Agreement without prior written consent of PPI.

(b) SGB is not and will not be an agent or legal representative of PPI for any purpose, and has no right to act for, or in any way obligate, PPI.

(c) Any disputes under this Agreement will be settled under the Rules of Conciliation and Arbitration of the International Chamber of Commerce with costs of arbitration to be shared equally by both parties and arbitration hearings to be held in San Francisco, California. The decision in such arbitration shall be binding upon the parties hereto and may be enforced in any court of competent jurisdiction.

(d) The Agreement is to be construed under the laws of the State of California, U.S.A. SGB represents that no provision of the Agreement contravenes any statute, rule of law or regulation in effect in the United Kingdom, and that, to the best of its knowledge and belief, no such provision contravenes any statute, rule of law, or regulation in effect in any other country within the Licensed Territory. Should any provision in the future have such effect, PPI may waive performance of such provision.

(e) The Agreement may be modified only in writing: executed by both parties. No oral arrangements shall be binding on either party.

(f) Waiver by either party of any term, provision, or condition of the Agreement shall not be taken as a waiver of the same term, provision, or condition in the future nor of any other term, provision, or condition of the Agreement.

(g) Any notice provided for in the Agreement will be deemed given when delivered or sent by registered mail to President, Pacific Plantronics, Inc., P. O. Box 635, Santa Cruz,

California, U.S.A., in the case of a notice intended for PPI, or when delivered or so mailed to General Manager, Communications Division, S. G. Brown Limited, King George's Ave Watford, Hertfordshire, England, in the case of notice intended for SGB, or to such other address as either party might designate to the other by written notice so delivered or mailed.

(h) SGB will take any necessary steps, at its expense, to obtain any approval needed from its government of the Agreement including any approval needed to make payments provided by the Agreement.

(i) The Agreement will come into force and be effective when signed by the appropriate officers of both parties providing any approvals required, as discussed in Section 18(h), have been received.

ACCEPTED:

S. G. BROWN LIMITED

ACCEPTED:

PACIFIC PLANTRONICS, INC.

By

By

Date

Date

G 942

687603

1034

APPENDIX A

PACIFIC PLANTRONICS, INC.

Issued Patents and Pending Applications

As of July 1, 1968

Patents

Wilson - U. S. Patent 3,168,934

Larkin - U. S. Patent 3,184,556

and corresponding

Larkin - British Patent 1,009,818

Wilson - U. S. Patent 3,388,767

Pending Patent Applications

Wilson - U. S. Application Serial No. 612,018; covers the concept of custom molding an earpiece mount in the shape of the outer ear of the wearer by using a casting compound contained within a flexible sack which is pre-formed to the general shape of the outer ear and which may include an internal capsule of an activating ingredient for curing the casting compound when desired.

Corresponding Convention applications filed in countries outside the U. S. as follows:

Japan Application No. 4761/1968

Great Britain Application No. 1300/68

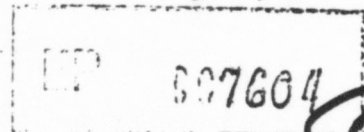
Sweden Application No. 989/68

France Application No. 137,230

Germany Application No. P 43 854 IXd/30d

Belgium Application No. 53,854

6943



1033



Wilson - U. S. Application Serial No. 714,396;  
covers amplifier apparatus for operation with  
an electroacoustic transducer to provide  
signal output on a pair of lines which also  
supply the operating power. One embodiment  
operates at high gain in response to voice in-  
put signals and operates at low gain in the  
absence of voice input signals for suppressing  
background noise.

Bernardi & Collier - U. S. Application Serial No. 722,670;  
covers a mounting structure for microphone  
and receiver transducers that is readily con-  
vertible from a rigid hand-held device to a rota-  
tably adjustable head mounted device using  
elements which are captivated on the structure.

Corresponding Convention applications to be filed  
within the following countries:

Japan

France

Great Britain

Germany

Sweden

Belgium

Jensen & Schaumberg - U. S. Application (Number not yet  
received); covers the concept of supporting  
microphone and receiver transducers in a common  
structure which provides a high degree of isola-  
tion from intercoupling vibrations that tend to  
establish instability and oscillations in the  
associated electroacoustic system.

6944

887605

6036

APPENDIX B

This Appendix refers to paragraph 1 (a) of the basic Agreement, and defines the products covered by the Agreement, as follows:

All models and types of headset products manufactured and marketed by PPI for general use in commercial telephone and non-telephone communications applications, and modifications and variations thereof, including combination headset/handsets, except

1. Products designed and/or manufactured for individual customers on an exclusive contract basis, provided that this exception shall not entitle PPI to manufacture or sell such products in the Licensed Territory in competition with the Licensed Products sold by SGB.
2. Products designed and/or manufactured especially for U. S. Government agencies, unless specific approvals permitting foreign sale can be obtained.
3. Products manufactured by PPI under license from a third party, unless specific approvals permitting the inclusion of said products under provisions of this Agreement can be obtained from the third party.

6945

697606

1037

- 2 -

APPENDIX C

This Appendix refers to paragraph 2 (b) of the basic Agreement, and defines the Licensed Territory covered by the Agreement and the scope of SGB's authority to sell and distribute therein as follows:

1. SGB has the exclusive right to sell, rent or lease Licensed Products to the Public Telephone Administrations (PTTs) in the following countries, subject to the conditions set forth below:

United Kingdom

India

South Africa

Pakistan

Rhodesia

Conditions:

SGB's exclusive right to sell, rent or lease to the PTT in the United Kingdom becomes non-exclusive in the event formal approval for use of Licensed Products within the United Kingdom is not granted by such PTT within eighteen (18) months of the date of this Agreement, and SGB's exclusive right to sell, rent or lease Licensed Products in the other countries listed above becomes nonexclusive within the individual countries in the event formal approval for use of Licensed Products within the country is not granted by the PTT having jurisdiction within twelve (12) months of formal approval by the PTT in the United Kingdom.

2. SGB has the nonexclusive right to sell, rent or lease Licensed Products to private telephone subscribers, private telephone systems, manufacturers and distributors of telephone equipment and systems, and to nontelephone communications users and manufacturers in the following countries or geographic areas:

United Kingdom: All countries

<u>Europe:</u>	Sweden	Germany	Switzerland
	Norway	France	Austria
	Finland	Netherlands	Italy
	Denmark	Belgium	Spain
	Portugal		

6946

507607

1038



Africa: All countries

Asia and Pacific Basin: India  
Australia

Pakistan  
New Zealand

G 947

EP 007608

1039

APPENDIX D

Warranty Policy: Pacific Plantronics products are guaranteed free of defects in workmanship and guaranteed free of mechanical or electrical defects for a period of one year from their date of shipment. While cords and plugs are not covered by any warranty, Pacific Plantronics does guarantee their workmanship as specified above.

Warranty Card: Warranty Cards are supplied with certain Pacific Plantronics products. It shall be the responsibility of the end user to return the Warranty Card promptly to Pacific Plantronics upon purchase of the product.

Warranty Conditions: All products which are returned to Pacific Plantronics for repair are subject to inspection. If, upon inspection, it is the opinion of our inspectors that the items returned were subjected to negligent care, misuse, or that they were tampered with, or that field repair had been attempted, all guarantees and warranties are void and a charge will be made for their repair at our standard rates.

6948

LP 007609

1040

AUG 14 RECD

London. August 12, 1964.

Mr. Keith Larkin, President,  
Pacific Plantronics Inc.,  
P.O. Box 604,  
Santa Cruz, California.

Dear Keith:

It was a real pleasure to talk with you yesterday and to let you know ~~that~~ that after a struggle of many weeks we have been successful in arriving at this good stage with S.G. BROWN LIMITED--where there is an agreement to agree. I am not going to enlarge on the conversation which was held between Mr. Diederichs, General Manager, Mr. Ibbotson, Chief Engineer, myself and Courtenay and yourself. We were able to listen into your responses so all of us knew what was going on.

Mr. Diederichs will this day be writing direct to you with copy to me, confirming your phone talk and with some ~~in~~ other questions. Your prompt response will have to go direct to him. From now on you are on your own and direct communication must take place between yourselves.

Having been here for three months plus much longer than anticipated, I have set August 24 as the day to leave London. I shall not be back in San Francisco at the end of October or early November.

Last night I airmailed to you three separate pieces of literature which should tell you all about Hawker Siddeley and the workings of Brown who as you will see are owned 51% by Hawker Siddeley. I am sure you will appreciate that a tie in with this group is one to be proud of and in which you can have every confidence and which should prove of much benefit to PPI.

Previous negotiations were made with Telephone Manufacturing Co. Ltd and Shipon Automation--though unsuccessful, valuable experience was gained--so much so that I now know that Brown are by far the best people for you to be associated with; they possess the best qualifications in this field of communications not only to manufacture but also to market. They are really a fine bunch of chaps.

Mr. Diederichs has told you of the urgency of the situation and I know that there most certainly is one. Therefore speed is of the very essence of these negotiations. The product has to be shown at this all important meeting of the British Joint Services Committee where new products are to be offered.

Dr. Brent is proceeding with the provisional application. He was asked to hold matters up some time ago because I wanted to save the firm some money in case I failed in my mission--but it just cannot be held up any longer and in view of the turn of events, I am sure you will agree.

DEFENDANT  
EXHIBIT

NO. II-

692

007578

104



AIR MAIL

STEVENSON, LANGHIER, PARRY & ROLLINSON

CHARITABLE PATENT AGENTS

5 QUALITY COURT,

CHANCERY LANE,

LONDON, W.C.2.

TELEPHONE: HOLBORN 6393

TELEGRAMS: PATENT WESTCENT. LONDON.

CABLES: LAWLAN. LONDON. W.C.2

U.S. ASSOCIATES:  
LANGHIER, PARRY,  
CAW & LANGHIER  
10 COLUMBUS CIRCLE,  
NEW YORK, 19

AND  
MONAGHOCK BLOCK,  
CHICAGO.

M. BENT, PH.D., F.R.C.  
A. J. HEWLETT, B.A. OXON.  
A. J. FINKINS, M.A. CANTAB. AM.I.E.E.  
J. WARD  
C. B. HODGE, PH.D., AM.I.E.E.  
TRADE MARKS  
L. R. V. WHITE, M.I.T.M.A.  
J. CARPENTER, M.I.T.M.A.  
A. J. M. GRANT, M.I.T.M.A.

YOUR REF.

PLEASE QUOTE OUR REF. 1042/1042

Twelfth  
August  
1964

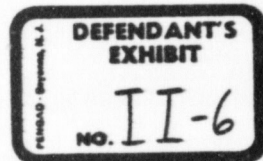
C.P. Graham, Esq.,  
Messrs. Pacific Plantronix Incorporated,  
Post Office Box 604,  
Santa Cruz, California.

Dear Sir,

Following on our letter of the 21st July, we now write to tell you that Mr. Benavitch has advised us that agreement has been reached with Messrs. S.G. Brown Limited and that the British Company is most anxious that a patent application should be filed.

For this purpose, therefore, we are enclosing the necessary Application Form for the filing of the British Patent application and this form should be signed by you, or by some executive official of the company, under seal and it should also be signed by Mr. Larkin where indicated in pencil since the British Law requires the assenting signature of the inventor to the filing of the application.

For the purposes of record, we think that it is desirable that Mr. Larkin should also sign a simple letter confirming that the right to file the British patent application has been assigned to your company and a suitable form of letter is enclosed which is drafted upon the basis that Mr. Larkin is an employee of the company; British law requires that assignments of this character should be signed over a sixpenny stamp and if there is any comparable provision in the United States law, we suggest that you put the appropriate stamp on at your end, while if there is no equivalent provision, we would suggest that you have Mr. Larkin sign over a 10 Cent stamp.



1042

C. F. Graham, Esq.

London

When you return the completed application form to us, we should be grateful if you would also return the enclosed copy of the assignment letter showing the date and manner of signing by Mr. Larkin.

Arising out of the discussions Mr. Benavitch had with Messrs. J.C. Brown Limited, we were approached by Mr. V. Diederichs who is General Manager of J.C. Brown Limited, who explained that he was anxious to have a sight of the text of the proposed patent application and we explained that it would be necessary to get specific authority from you to disclose the contents of the application, but that we believed that you would be prepared to give us written authority to supply a copy of the British patent application once it had been filed.

Therefore, perhaps you would be good enough, when returning the application form to us, to ensure that your covering letter also specifically authorises us to supply a copy of the application confidentially to Mr. Diederichs promptly after the filing of the application.

We will be putting in hand the preparation of an amended text of the specification to take account of the amendments which were made to the original United States application arising out of the official action and shall generally make such other minor revisions in the description and claims as appear to us to be desirable for the purpose of putting the application into a form suitable for practice in the British Patent Office.

Would you please give us details of Mr. Larkin's Post Office address so that we can complete the form on its return to us, on our own typewriter.

Yours faithfully,  
STEVENS, LANGNER, PARRY & ROBINSON  
*[Signature]*

AIR MAIL.

Copy to Mr. Benavitch.

1044

1043

# S. G. BROWN LTD

COMMUNICATIONS DIVISION

KING GEORGE'S AVENUE  
WATFORD  
HERTS.

TELEPHONE: WATFORD 23301  
TELEGRAMS: RADIGLINK, WATFORD  
TELEX: 22412 - RADIGLINK WFTD

HEAD OFFICE  
SHAKESPEARE STREET  
WATFORD  
HERTS.

APEN WORKS ST ALPINS ROAD WATFORD, HERTS.  
DEVONSHIRE WORKS DUKES AVENUE CHISWICK, LONDON, W.4

DIRECTORS  
SIR AUBREY BUNKE, Chairman  
R. G. MCCOY, Managing Director  
D. F. DEVINE (U.S.A.)  
A. S. KENNEDY  
C. W. FENELLE (U.S.A.)

OUR REF.: VHAD/FMS

YOUR REF.: -

13th August 1964.

Pacific Plantronics Inc.,  
P.O. Box 604,  
Santa Cruz,  
California,  
U.S.A.

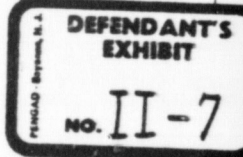
For the attention of Keith Larkin Esq - President.

Dear Sirs,

We refer to our telephone conversation of the 11th August, concerning the proposed Licensing agreement between our two Companies for the exclusive rights to manufacture and to sell under the patents held by you on the Plantronic Headset Assemblies. As stated in the course of our telephone conversation, we are willing to implement this agreement on the following terms:-

- (1) An initial payment on signature of the agreement of \$6,000 U.S. (Six thousand U.S. Dollars.)
- (2) 5% royalty on sales but excluding, prior to calculation of the royalty, the value of the bought-out piece parts from your Company.
- (3) A full set of reproducible drawings, specifications, factory test schedules, technical details, manufacturing "know-how", to be made available to us on signature of the agreement.
- (4) A minimum annual payment of \$2,000 U.S. for royalty beginning eighteen months after signing of contract.
- (5) A condition of the agreement is that you will take out patents in each of the territories covered by the proposed agreement.

/continued...



G-923

807572



Continuation

- 1 -

- (6) We wish you to confirm that we have the right to manufacture this unit in entirety in view of the fact that you have indicated to us that certain items contained in your headsets are bought-out by you, and that you have the right to license us to manufacture these bought-out items.

This right to manufacture in entirety is essential if we are to have access to the Defence Market.

- (7) The territories covered by the license, we understand to be the world with the exception of the United States, possibly Canada, Japan, Hong Kong and certain other countries in S.E. Asia, which you will nominate.
- (8) The agreement to be valid for five years with option to extend on the same terms.

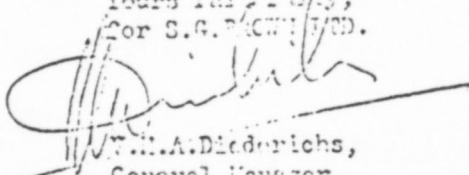
-----

We would particularly like to know if you will include Canada, as we already have a subsidiary Company located there.

We would like your assurance that in the event of your desiring to license Japan to manufacture and sell these products, any such agreements will specifically exclude the territories granted to us in the proposals now under consideration.

We wish to restate the urgency of completing this matter with as little delay as possible in view of the fact that there is a meeting to be held late September in England, at which new equipment will be considered for use by the British Armed Services, and we wish to present your product under our name at that time.

Yours faithfully,  
For S.G. Brown Ltd.

  
W.A. Diederichs,  
General Manager,  
Communications Division.

6924  
007573

1043

August 18, 1964

Stevens, Langford, Pomeroy & Hollinson  
5 Gilling Court,  
Chancery Lane,  
London, W.C.2  
England

Gentlemen:

Enclosed please find the patent application, properly signed, with attached letter concerning disclosure of the patent application to S. G. Brown Ltd; I will leave this to your judgment.

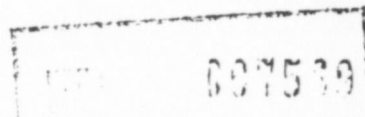
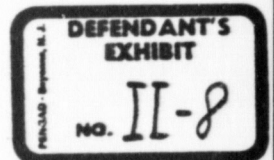
Please advise developments after you have filed the patent.

Yours very truly

PACIFIC PLANTRONICS, INC.

Keith Larkin  
President

KL:vp  
Enc



# S. G. BROWN LTD

DIRECTORS  
SIR AUBREY BURKE, Chairman  
R. G. MCCOY, Managing Director  
D. F. DEVILLE (U.S.A.)  
A. S. KRINEDY  
C. W. PERELLE (U.S.A.)

COMMUNICATIONS DIVISION  
KING GEORGE'S AVENUE  
WATFORD  
HERTS.

SEP 14 RECD  
HEAD OFFICE  
SHAKESPEARE STREET  
WATFORD  
HERTS.  
and at  
APEN WORKS DEVONSHIRE WORKS  
ST. ALBANS ROAD DUKES AVENUE  
WATFORD, HERTS. CHISWICK, LONDON, W.4

TELEPHONE: WATFORD 21301  
TELEGRAMS: RADIOLINK, WATFORD  
TELEX: 21412 - RADIOLINK WYFD

OUR REF: VIMD/PMS/

YOUR REF: KLivp

9th September 1964.

Pacific Plantronics, Inc.,  
Post Office Box 604,  
Santa Cruz,  
California,  
U.S.A.

For the attention of Keith Larkin Esq - President.

Dear Sirs,

Thank you for your letter of the 21st. August, received during my vacation.

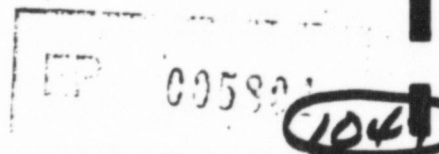
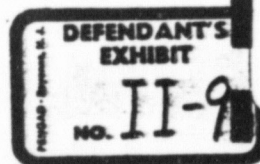
Vide paragraph two of your letter, Gt. Britain, France, Belgium, Holland, Italy and possibly Germany would be sufficient.

Reference Knowles Transducers, we have spoken to Underwood and are satisfied that they are willing to produce the unit over here should the (defence) need arise.

We agree not to contest validity of your patent but are not willing to commit ourselves on the initial agreement to more than five years with renewal rights, since we have no idea how well the idea will be accepted in Europe including Gt. Britain.

We agree that initially it will be necessary to purchase from you the transducers, acoustic tube and wire.

/continued.....





Continuation

- 1 -

Our Chief Engineer, Mr. T.D. Ibbotson, has written to you stating how many of each configuration we require for our demonstration to the Army; our official order will follow but please do not delay despatch.

Yours faithfully,  
for S.G.M.O.W. LTD.

*V.H.A. Diedrichs*

V.H.A. Diedrichs,  
General Manager,  
Communications Division.

EP

005802

1048

Feb 22 1966  
Communications Division

King George's Avenue Watford Hertfordshire England  
Watford 23301 Cables: Radiolink, Watford Telex: 23412

AHSP/CP

Keith Larkin, Esq., President,  
Pacific Plantronics Incorporated,  
P.O. Box 604,  
Santa Cruz,  
California,  
U.S.A.

10th February, 1966.

Dear Mr. Larkin,

Under the terms of our Agreement covering the production and sale of Plantronics Audio Gear, in addition to the exclusive license covering Great Britain, France, Italy, Belgium, Germany and Holland, we are, you will recall, permitted to expand to include additional areas by specific name, and I am very pleased indeed to advise you that we have completed a very thorough market survey of the E.F.T.A. countries.

The result of this survey is most encouraging indeed and we have followed up the survey with a "sampling" exercise initially in Norway, Sweden and Denmark.

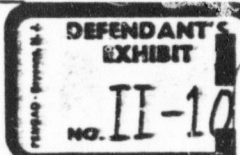
Under the circumstances and in order to keep this matter regular, will you please now officially confirm the expansion of our Agreement to include the E.F.T.A. countries?

Incidentally, the overall picture for the "Pacific" Headset is beginning to look quite good - samples are with our military signals and radar development establishment; with virtually all radio manufacturers in the United Kingdom and with most of our Overseas Agents and many Overseas Manufacturers. Initial reaction to our samples is very encouraging and even so soon as the end of this year will, I feel, see the Plantronics Headset formally established in a very wide area indeed.

I look forward to having your acquiescence to this expansion in due course.  
With kind regards.

Yours sincerely,  
for S. G. BROWN LTD.,

A. H. S. Pickburn,  
Sales Manager,  
Communications Division.



EP

11,096.1

1049

PLANTRONICS

March 25, 1966

Mr. Maurice Benavitch  
150 Font Boulevard  
Suite 9L  
San Francisco, California

Dear Mr. Benavitch:

Attached you will find all of the correspondence I have generated to date, related to our S. G. Brown agreement.

You will, no doubt, note that I have not officially granted E.F.T.A. coverage yet. This is due only to the fact that our legal people are trying to agree on how we can satisfy the clause related to patent coverage in all countries granted in the agreement, since we appear to be prohibited from doing this as a result of the "1 year" deadline.

Rather than delay any longer, I have elected to get things moving. The agreement and requested coverage acceptance will definitely go out the week of March 28th.

I have also enclosed copies of the two letters from Mr. Diederichs that you were kind enough to send us.

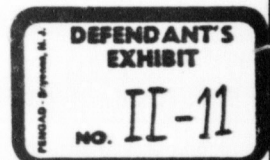
Sincerely,

PACIFIC PLANTRONICS, INC.

S. G. Spragens  
Director of Marketing

SGS:jps

Enclosures



1050 EP 11,046-2



March 25, 1966

Dr. M. Brent  
Stevens, Langner, Parry & Rollinson  
5 Quality Court,  
Chancery Lane,  
London W. C. 2, England

Dear Dr. Brent:

By way of introduction, I have recently assumed the responsibility of Director of Marketing for Pacific Plantronics, Inc., and I am currently in the process of trying to unravel our foreign patent position relative to our S. G. Brown agreement.

As I currently interpret the situation, there are two basic problem areas that need to be resolved, and secondly, two questions you may be able to answer.

Problem Definition

1. Now that our British Patent has been issued, it is essential that we defend our position against the Airmed Ltd. version.
2. We must clarify our position relative to the French Patent. I have enclosed copies of three letters related to Action 1, initiated with Mr. Chognard, our U. S. Patent Counsel, as a result of a letter from Mr. Bentley, whom I believe you know. These letters are intended only as background information.

Questions

1. Is there any possibility of obtaining patent coverage in additional foreign countries where we are represented by S. G. Brown? It is my understanding from our attorney in this country that you are allowed only one year after issuance of our original patent to file in other countries. I would like verification of this.

DEFENDANT  
EXHIBIT  
NO. II-1

1051

EP 11,096.3

2. I find correspondence and applications in our files indicating that we have filed for a Japanese Patent, through your office. Has this Patent ever been issued?

I respectfully and officially request that you do the following: Please confirm in writing that my definition of the problem areas are correct; take whatever immediate action you deem necessary; confirm if possible, my questions; provide me, for budget purposes, with an estimated cost to satisfactorily and completely comply with our commitments to S. G. Brown, related to Patent coverage.

I regret whatever inconvenience our delay has caused you, however, we are most anxious to resolve this situation, and I would appreciate your considering me as your point of contact for any additional information you may require. I might mention that Mr. Larkin is now Vice Chairman of our Board, and no longer participates in the day to day operation of our Company.

My sincere appreciation for whatever efforts you may be able to extend on our behalf.

Very truly yours,

PACIFIC PLANTRONICS, INC.

S. G. Spragens  
Director of Marketing

SGS:jps

Enclosures

1052 EP11,096-4

SGS/jps.

MB/DC.

Twentieth  
March  
1966

S.G. Spragens, Esq.,  
Messrs. Pacific Plantronics Inc.,  
Post Office Box No. 635,  
Santa Cruz, California.

Dear Mr. Spragens,

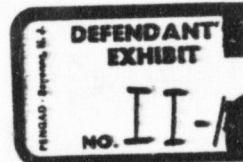
I am merely sending you a formal acknowledgment as to the receipt of your letter of the 25th March which I will investigate and deal with more thoroughly in the very near future.

As a preliminary point, I will answer your first question by remarking that the one-year period referred to by your own Attorney runs from the date of initial filing of the original application for patent so that you will see that the original Convention year permitting the claiming of priority has long since lapsed and the publication of your British patent now precludes the filing of valid patents in any other countries; indeed, it is my understanding that your United States patent has probably already issued.

I will direct future correspondence in this matter to you.

Yours truly,

AIR MAIL.



1053

EP5719.3



PACIFIC  
PLANTRONICS  
INC.

POST OFFICE BOX NO. 635  
SANTA CRUZ, CALIFORNIA  
TELEPHONE (408) 426-5550

April 1, 1966

Mr. A. H. S. Pickburn  
Sales Manager  
Communications Division  
S. G. Brown, Ltd.  
King George's Avenue  
Watford, Herts.,  
England

Dear Mr. Pickburn:

As I mentioned in my previous letter, as a matter of routine practice I requested that our legal counsel review our agreement dated February 5, 1965, as a result of your letter dated February 18, 1966, requesting confirmation of agreement expansion to include E.F.T.A. countries.

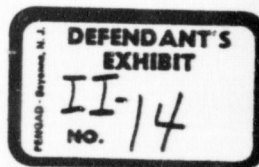
Our attorney noted several areas in this agreement which he felt badly needed clarification and further elaboration. These points in no way alter the fundamental of the agreement, but rather provide a more comprehensive definition of its limits. The original agreement appears to have left several important points uncovered.

A new agreement has been drafted which includes the additional coverage you have requested. However, I have elected not to send this for your perusal at this time, in the hopes that we will have the opportunity to review this personally with Mr. Diederichs during his anticipated visit to this country.

In the interim, you may consider this letter as a part of our initial agreement, granting expansion to include the following countries:

Sweden, Norway, Denmark, Finland, India, Pakistan,  
New Zealand, South Africa and Australia

continued.



1054

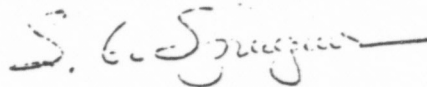
EP  
11097

SUPPLIERS OF ASTRONAUT HEADSETS TO PROJECTS MERCURY, GEMINI AND APOLLO

Again, I regret whatever inconvenience we may have caused you as a result of our delay. Now that some of the past details have been resolved, I sincerely look forward to supporting your future efforts.

Very truly yours,

PACIFIC PLANTRONICS, INC.



S. G. Spragens  
Director of Marketing

SGS:jps

EP  
11388

1055

October 6, 1967

S. G. Brown, Limited  
Stoke Newington Street  
W. 10 1RD  
Hertford County  
ENGLAND

Continued:

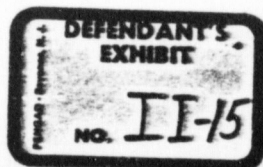
In accordance with Section 9 of the Agreement, dated the 5th day of February, 1965, between S. G. Brown, Limited and Radio Shack International, Inc., you are hereby notified that by reason of the failure to make timely payment of royalties provided for under Section 6 thereof, Radio Shack International, Inc. elects to terminate that Agreement forthwith. Accordingly we are returning your check dated October 4, 1967.

Our management has followed closely the results of S. G. Brown's efforts to develop various markets and applications for miniature headsets, and your progress in preparing to manufacture these units to our established design quality standards.

I would be less than candid if I did not express our concern over lack of success and progress in several important areas. I am sure you will agree that the most important failure lies in the area of developing sales to the telephone market, both through the respective C/O/P/T's in the various countries, as well as through the private apparatus trade channels.

We strongly feel that S. G. Brown, Ltd., is not properly equipped to exploit the European telephone market and thereby share in the rapidly growing segment of portions of the non-telephone markets outside of the European area. We are also concerned about the performance and quality standards of the units which you forwarded to us for evaluation. Our Engineering and Quality Assurance groups found that those units fall short of conforming with the terms of RSI's basic understanding as to product standards.

continued.



EP  
11105  
1056



October 6, 1957

- 2 -

I would like to meet with you in London, Wednesday, October 23rd, to explore the situation in detail, and to propose elements of a substantially different approach.

If this is satisfactory, I shall plan to call you the afternoon of Tuesday, October 22nd, upon arrival at the Central Tower Hotel.

Sincerely,

PACIFIC PLANTRONICS, INC.

C. P. Graham  
President

CPG:js

Attachment (Check #0891 20204)

bcc: P. Hornrighausen ✓  
R. Grootzinger  
S. Spragens

EP  
11100

1057

LAW OFFICES OF  
PILLSBURY, MADISON & SUTRO  
STANDARD OIL BUILDING  
325 RUSH STREET  
SAN FRANCISCO, CALIFORNIA 94104  
TELEPHONE 421-6133  
AREA CODE 415

February 14, 1968

Hucker Siddeler Dynamics  
Limited - Franchise from  
Pacific Plantronics, Inc.

Paul E. Homrighausen, Esq.  
Messrs. Morrison, Foerster, Holloway,  
Clinton & Clark  
120 Montgomery Street  
San Francisco, California 94104

Dear Paul:

The continued silence of Pacific Plantronics, Inc., is increasingly distressing. I trust that it does not indicate a retreat from the agreement reached in our conference of Wednesday, January 31st. For S. G. Brown's part, I am confident it remains willing to abide by the agreement reached.

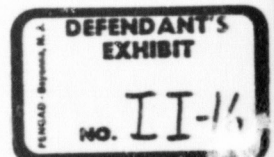
I trust that no formal reservation of rights is necessary, but in view of the passage of time I feel perhaps it should be confirmed that Brown has in no way conceded the effectiveness of PPI's purported termination. Unless I have received some definite expression of PPI's intention to proceed as agreed by the end of this week, it will be necessary that I advise Brown to make a more formal reservation.

Very truly yours,

*Bill*

William B. Christy IV  
for  
Pillsbury, Madison & Sutro

cc: Mr. R. W. Guenier



E.P. 1112

1058

September 25th, 1970.

Pacific Plantronics Inc.  
Post Office Box No. 635  
Santa Cruz, Calif. 95060  
UNITED STATES OF AMERICA

For the attention of - Mr. S.G. Spragens, Vice President.

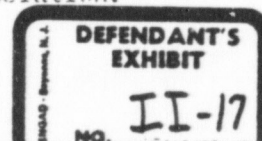
Dear Sirs,

We thank you for your letter of the 11th September. We are not, however, in accord with the general content of the letter or the proposed amendment to our licence agreement of July, 1968.

Taking the points raised in your letter in order:-

1. We agree that under part 1 of Appendix "C" to the licence agreement in the United Kingdom is now a non-exclusive sales territory.
2. Restriction of manufacture to the MS.50 (metal capsule) only would not be acceptable in any circumstances. We believe that it would be a short sighted policy to be linked with this equipment only.
3. Our view is similar to item 2 above in that in order to reach and maintain a strong and viable market position, it is essential to offer the full range of PPI equipment and have the capability of including product improvements and new models, (otherwise one would be best not in the business at all.)
4. Pricing arrangements for factored equipment require clarification since our first impression is that there would be insufficient margin available to us. Perhaps you could elaborate the proposal indicating the actual buying price applicable to us, regardless of quantity and the intended distribution of your price list and the reason for your wish to revoke clause 5B of the licence.

Whilst the long term posture of SGB in communications has been in the non-telecommunications sector, activities over the past six years have included considerable investment in time, effort and monies with telephone authority. The benefits and the return of this investment have not yet been realised. The primary cause for this as you know has been the technical barrier to the Pacific equipment with United Kingdom authorities and some start up problems in the LME/PPI/SGB proposed association.



E.P. 11150  
1054



September 25th, 1970.

Our efforts with the United Kingdom authorities have not been fruitless and the obvious route now is a joint PPI/SCB approach to the GPO to secure a development contract for a headset suitable to the GPO environment and to gain acceptance for it, or possibly a variant of the existing headset, for use by its marketing branch.


It has been our joint agreement since 1968 and in fact it was one of the bases for the licence, that we would have the opportunity to supply production quantities to LME for at least the first three years requirement and we envisaged quantities of 17,500 during this period. A return on our considerable investment demands such an outlet. We have appreciated for some time that it would be necessary to make further capital investment to meet the specifications required by LME and their customers in Europe.

In the penultimate paragraph of your letter you state that it is your intention to deal directly with LME on future orders and ask us to cease contact with them. We insist that this is neither in the spirit of our understanding and agreement of July, 1968 nor is it proper under the terms of that agreement. We sincerely hope that we will not be forced into the position of competing for this business in Sweden and that we can resolve the matter in accordance with our current arrangement.

It appears to be your opinion that the route into volume business in Europe is not through commercial and technical association with SCB. If you feel this strongly, to the degree that co-operation would be insufficient and ineffective, which is not our belief, the only course open to you would seem to be to negotiate termination of our licence agreement and offer compensation relative to our investment to date, our anticipated investment and eventual returns.

We concur that our relationship over the past years has been pleasant but to be effective our view is that a closer commercial and technical association is necessary to achieve the performance in the market area that we both seek.

Yours faithfully,  
for S.G. Brown Limited



V.H.A. Diederichs  
Director & General Manager

E.P. 11100

1060

October 16, 1970

✓  
Mr. Victor Diederichs  
Director & General Manager  
Communications Division  
S. G. Brown Limited  
King George's Avenue  
Wetford, Hertfordshire, England

Dear Victor:

This is intended simply as a personal note to again thank you for your courtesies and consideration during my recent visit. The same thanks, of course, is extended to the other members of your staff, namely John Sloan and David Townsend.

I would also personally appreciate it if you would convey my best wishes and warm greetings to Elma. It is indeed unfortunate that all of our business relationships cannot be as pleasant and meaningful as our personal and social exchanges.

Referencing your order No. CD-00059, as you are no doubt aware, we are still short a total of four units on this order. For some reason, I seemed to have failed in my attempt to communicate to your organization that if they shipped just the exact quantity required, that certain key items, such as transducers, the net result will invariably be short shipments, subsequent delays and confusion in attempting to close out the order. This seems to be precisely where we are at this time. I received a letter from you Mr. Roberts dated September 8, and he appears to be confused as to the interchangeability of transducers. We must have the following parts to close this order complete:

1. 3 each, 3,000 ohm mic transducers, Knowles Part No. BA-2502
2. 1 each, 300 ohm receiver transducer, Knowles Part No. XD-744
3. 1 each, 600 ohm receiver transducer, Knowles Part No. 2510
4. 1 each, 300 ohm mic transducer, Knowles Part No. 703

DEFENDANT'S  
EXHIBIT  
NO. II-18

E.P. 1115

1061

October 16, 1970

- 2 -

Victor, attached you will find a more formal letter which I felt obliged to submit to S. G. Brown for records purposes. This is merely an attempt to document my interpretation of the resolution reached between you, Tom Sneddon and myself on the evening of September 26.

Presuming that you are still in agreement with the fact that S. G. Brown and Pacific Plantronics should cooperate closely on a technical basis in an effort to resolve once and for all objections which the GPO evaluation has raised, I think that we can safely state that our future business relationship offers every possibility of being productive and profitable for both parties concerned.

My best regards to you.

Sincerely,

PACIFIC PLANTRONICS, INC.

Stephen G. Spragens  
Vice President

SGS:sk

P.S.: Is there any possibility that you could join David Townsend in his forthcoming visit to Santa Cruz? I understand that the sheriff has rescinded his order for your arrest.

EP 11100  
1062



# PLANTRONICS

August 30, 1972

Victor H. A. Diederichs  
General Manager  
Communications Division  
S. G. Brown, Ltd.  
King George's Avenue  
Watford, Hertfordshire  
England

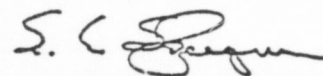
Gentlemen:

In accordance with Section 15(d)(4) of the Licensing Agreement, dated the first day of July, 1968, between S. G. Brown, Ltd., and Pacific Plantronics, Inc., you are hereby notified that by reason of the fact that the acquisition of S. G. Brown, Ltd. by RACAL, publicly announced on July 18, 1972, constitutes a substantial change in the ownership of S. G. Brown, Ltd., Pacific Plantronics, Inc. hereby elects to terminate that Agreement as of the above date.

Further, we respectfully call your attention to paragraph 15(f) and request that all manufacturing and sales activities of the previously licensed product(s) or direct copies or direct derivations thereof cease effective this date.

Very truly yours,

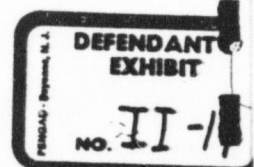
PACIFIC PLANTRONICS, INC.



S. G. Spragens  
Vice President - International

SGS:lf

cc: E. T. Harrison  
T. M. Sneddon



EP. 14,184

PACIFIC PLANTRONICS, INC.

385 REED STREET, SANTA CLARA, CALIFORNIA 95050 (408) 219-1160 - TELEX 315575

1063

August 19, 1965

John P. Austin, Esq.  
Morrison, Foerster, Holloway, Clinton & Clark  
Crocker Building  
San Francisco, California 94104

Re: Investigation of Pacific Plantronics, Inc.  
Larkin Patent No. 3,184,556  
O.F. 890

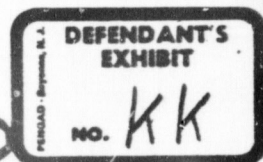
Dear Sir:

Our firm represents Roanwell Corporation, which received a letter from you dated July 1, 1965, in which you advised that your client, Pacific Plantronics Inc. is the holder of Patent 3,184,556, issued to Wallace K. Larkin.

We have studied your letter and have made an investigation of the Larkin patent. It is our opinion that the claims therein defining a headset device are invalid.

As sometimes happens, the most pertinent reference was not discovered by the Examiner in his search of the prior art. The British patent to G. E. Pritchett (No. 191) dated January 15, 1878, discloses the basic combination claimed in Claim 1 of the subject Larkin patent. Pritchett (see Fig. 5) shows a telephone device adjacent the wearer's ear for two-way communication and clearly discloses the notion of conveying sounds from the wearer's mouth to the device by means of one tube, and conducting sounds from the device to the wearer's ear by means of a separate tube, as shown and claimed in the Larkin patent.

We have studied the file history of the Larkin patent and have noted that an argument was made therein in the amendment dated December 9, 1963, to the effect that the headset defined in



John P. Austin, Esq.

-2-

August 19, 1965

Claim 1 is patentable because two tubes are used, and that "This arrangement is not shown by Dreher (Patent 2,904,640) who only has one tube, nor by the other art cited by the Examiner." This argument resulted in the allowance of the claims. Whatever its merits with respect to Dreher, this argument is completely demolished by the Pritchett reference.

Furthermore, in our opinion, no patentable significance attaches to the use of the term "miniature" or any of its derivatives, since miniaturization was very old before the filing of the Larkin patent. Likewise, no patentable significance is seen in the qualification on the first acoustical tube as being "made of yieldable plastic material" (Claim 2) since such is disclosed in the Olney et al patent (column 5, lines 5-8).

While Pritchett shows a single transducer serving as both microphone and receiver, as was common in the telephones of that date, the change to separate transducers was made before 1900, and Larkin certainly cannot base a claim for novelty on the inclusion of two transducers instead of one.

Very truly yours,

Lester W. Clark

LWC:JFO/pw

bc: Mr. Donald W. Powers  
Theodore E. Gladstone, Esq.

1065



FILED

JUN 24 1970

C. D. EVENSEN, Clerk

NAYLOR & NEAL  
JAMES M. NAYLOR  
FRANK A. NEAL  
235 Montgomery Street  
San Francisco, California 94104  
362-7543

ATTORNEYS FOR PLAINTIFF

Of Counsel:

Carlsen, Carlsen & Sturm  
Warren A. Sturm  
1128 Plymouth Building  
Minneapolis, Minnesota 55402  
Area Code 612 - 338-4777

IN THE UNITED STATES DISTRICT COURT  
FOR THE NORTHERN DISTRICT OF CALIFORNIA

SOUTHERN DIVISION

THE TELEX CORPORATION,

Plaintiff,

v.

PACIFIC PLANTRONICS, INC.,  
Defendant.

C-70 1340

CIVIL ACTION NO.

PATENT INFRINGEMENT  
No. 3,280,273

C O M P L A I N T

TO THE HONORABLE JUDGES OF THE UNITED STATES DISTRICT COURT FOR  
THE NORTHERN DISTRICT OF CALIFORNIA

Plaintiff, for its cause of complaint herein, allege  
that -

1. Jurisdiction of this Court is based on the Patent  
Laws of the United States of America.

2. Plaintiff, THE TELEX CORPORATION, is a corporation  
of the State of Delaware and has a place of business at 9600  
Aldrich Avenue South, Minneapolis, Minnesota 55420.

3. Defendant, PACIFIC PLANTRONICS, INC., is a corpora-  
tion of the State of California and has a place of business at  
111 Josephine Street, Santa Cruz, California 95060.

4. On October 18, 1966, United States Letters Patent  
No. 3,280,273 was duly and legally issued to plaintiff for an  
invention in an Operator's Headset; and since that date

Ex. LL

1066

1 plaintiff has been and still is the owner of said Letters  
2 Patent.

3 5. Defendant has for a long time past been and still  
4 is infringing said Letters Patent by making, selling and using  
5 operator's headsets embodying the patented invention, and will  
6 continue to do so unless enjoined by this Court.

7 6. Defendant has been and is aware of the existence  
8 of plaintiff's patent No. 3,280,273.

9 WHEREFORE PLAINTIFF DEMANDS a preliminary and final  
10 injunction against continued infringement, an accounting for  
11 damages, and an assessment of interest and costs and attorneys'  
12 fees against defendant, and such other and further relief as  
13 this Court may deem fit.

14 NAYLOR & NEAL

15  
16 By

*Frank A. Neal*  
Frank A. Neal

17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32

San Francisco, California

1 FLEHR, HONBACH, TEST,  
2 ALDRITTON & HERBERT  
3 ALDO J. TEST  
4 THOMAS O. HERBERT  
5 160 Sansome Street - 15th Floor  
6 San Francisco, California 94104  
7 Telephone: 781-1989

8 Attorneys for Defendant

9 IN THE UNITED STATES DISTRICT COURT  
10 FOR THE NORTHERN DISTRICT OF CALIFORNIA

11 THE TELEX CORPORATION, )  
12 )  
13 Plaintiff, )  
14 )  
15 v. )  
16 )  
17 PACIFIC PLANTRONICS, INC., )  
18 )  
19 Defendant. )

20 Civil Action No. C-70 1340 LHB  
21 DEFENDANT'S ANSWER TO COMPLAINT

22 COMES NOW defendant, Pacific Plantronics, Inc., and  
23 for its answer to the Complaint herein states as follows:

- 24 1. The allegations of Paragraph 1 of the Complaint  
25 are admitted.  
26 2. The allegations of Paragraph 2 of the Complaint  
27 are admitted.  
28 3. The allegations of Paragraph 3 of the Complaint  
29 are admitted.  
30 4. With respect to the allegations of Paragraph 4 of  
31 the Complaint it is admitted that United States Letters Patent  
32 No. 3,280,273 were issued to plaintiff on October 18, 1966 but  
it is specifically denied that said patent was duly and legally  
issued. Defendant is without sufficient knowledge to admit or  
deny that plaintiff has been and still is the owner of said  
Letters Patent and therefor leaves plaintiff to its proof.



1           5. The allegations of Paragraph 5 of the Complaint,  
2 and each of them, are denied.

3           6. The allegations of Paragraph 6 of the Complaint  
4 are admitted.

5           FURTHER ANSWERING the Complaint herein defendant  
6 alleges as follows:

7           7. That plaintiff's Patent No. 3,280,273 is invalid  
8 and unenforceable for failing to comply with the statutory re-  
9 quirements of patentability under 35 U.S.C. §§101, 102, 103 and  
10 112. Identification of publications and other prior art to be  
11 relied upon in anticipation of such patent and to show the state  
12 of the prior art at the time of the alleged invention, together  
13 with the names and addresses of the persons to be relied upon  
14 as prior inventors or as having knowledge of or as having pre-  
15 viously used or offered for sale the alleged invention of the  
16 patent will be provided in a timely manner pursuant to provi-  
17 sions of 35 U.S.C. §282.

18           8. If any of the claims of said Letters Patent No.  
19 3,280,273 are so broadly construed as to cover any product which  
20 defendant manufactures, uses or sells then such claims are  
21 invalid and void.

22           WHEREFORE defendant prays:

23           1. That the Complaint and this action be dismissed.

24           2. That plaintiff's patent No. 3,280,273 be declared  
25 not infringed by defendant and invalid and unenforceable.

26  
27  
28  
29  
30  
31  
32

1           3. That defendants be awarded their costs and  
2 reasonable attorney's fees together with such other and further  
3 relief as to the Court may seem just and proper.  
4

5                               Respectfully submitted,  
6

7                               By *Thomas O. Herbert*  
8

9                               Flehr, Hohbach, Test,  
10                              Albritton & Herbert  
11                              Attorneys for Defendant  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32

NAYLOR & NEAL  
JAMES M. NAYLOR  
FRANK A. NEAL  
233 Montgomery Street  
San Francisco, California 94104  
362-7543

ATTORNEYS FOR PLAINTIFF

Of Counsel:

Carlson, Carlson & Sturm  
Warren A. Sturm  
1126 Plymouth Building  
Minneapolis, Minnesota 55402  
Area Code 612 - 332-4777

IN THE UNITED STATES DISTRICT COURT  
FOR THE NORTHERN DISTRICT OF CALIFORNIA  
SOUTHERN DIVISION

THE TELEX CORPORATION,

Plaintiff,

v.

PACIFIC PLANTRONICS, INC.,

Defendant.

CIVIL ACTION NO. C-70 1340 LMB

PLAINTIFF'S INTERROGATORIES  
TO DEFENDANT

Plaintiff in the above-entitled action hereby pro-  
pounds the following interrogatories to Defendant to be answered  
by it under oath in accordance with Rule 33 of the Federal Rules  
of Civil Procedure:

\* \* \*

14. Specify with particularity the factual basis for  
each and every allegation contained in paragraph 7 of Defendant's  
answer stating separately such factual basis for each requirement,  
clause or statutory basis set forth therein which Defendant is,  
may, or intends to reply upon.

1071

6



4 NAYLOR & NEAL

5  
6 By Frank A. Neal

7 Of Counsel:

8 Carlsen, Carlsen & Sturm  
9 1120 Plymouth Building  
10 Minneapolis, Minnesota 55402  
11

12 ACKNOWLEDGMENT OF SERVICE

13  
14 Received two copies of the foregoing this 25<sup>th</sup>  
15 day of April, 1971.  
16

17 FLEHR, HOEBACH, TEST, ALBRITTON  
18 & HERBERT

19  
20 By John A. Flehr  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32

1 ELIHR, MOHRBACH, TEST,  
2 ALBRITTON & HERBERT  
3 ALDO J. TEST  
4 THOMAS O. HERBERT  
5 160 Sansome Street - 15th Floor  
6 San Francisco, California 94104  
7 Telephone: 781-1939

8 Attorneys for defendant

9 IN THE UNITED STATES DISTRICT COURT  
10 FOR THE NORTHERN DISTRICT OF CALIFORNIA

11 THE TELEX CORPORATION, )  
12 Plaintiff, ) Civil Action No. C70 1340 LMB  
13 v. ) DEFENDANT'S ANSWERS TO  
14 PACIFIC PLANTRONICS, INC., ) INTERROGATORIES  
15 Defendant. )

16 COMES NOW defendant, Pacific Plantronics, Inc., and  
17 in response to Plaintiff's Interrogatories to Defendant submits  
18 the following:

\* \* \*

25 Interrogatory No. 13: Specify with particularity the  
26 factual basis for the allegations contained in paragraph 3 of  
27 Defendant's answer to the complaint in this lawsuit.

28 Answer: All of the claims of the patent in suit are  
29 directed to a headset having two features which are clearly not  
30 present in the StarSet. These features are 1.) that the micro-  
31 phone tube extends from the bottom of the housing and the

1073

1 receiver tube extends from the top and 2.) that the microphone  
2 tube lies in contact with the operator's cheek to provide  
3 stability. If these two features are ignored, as they must  
4 be to even find a good faith assertion of infringement in the  
5 StarSet, then the patent in suit teaches nothing more than  
6 locating the housing of defendant's own MS50 behind the ear of  
7 the wearer. This would be an obvious combination of prior art  
8 such as of defendant's patent 3,184,556 (showing the use of  
9 accoustical tubes 26 and 29 connecting the microphone 12 and  
10 receiver 20 of a headset to the mouth and auditory canal of  
11 the wearer) and plaintiff's patent 2,882,348 (showing a hearing  
12 aid using a behind the ear housing for the microphone 52 and  
13 receiver 19 with an accoustical tube 13 connected between the  
14 receiver and the auditory canal of the wearer).

15 Furthermore, if the two above mentioned features are  
16 ignored, each and every claim of the patent in suit reads directly  
17 on plaintiff's own earlier patent No. 2,882,348. Patent No.  
18 2,882,348 differs from the patent in suit only in that the  
19 microphone tube 55 is short and extends sideways from the housing  
20 rather than extending forward to touch the face of the wearer.

21 -- Interrogatory No. 14: Specify with particularity the  
22 factual basis for each requirement, clause or statutory basis  
23 set forth therein which Defendant, is, may, or intends to reply  
24 upon.

25 Answer: In addition to the matter set forth in  
26 answer to Interrogatory No. 13, the patent in suit is invalid for  
27 the following reasons as presently advised.

28 A. The patent in suit, particularly in the  
29 broad sense required to even assert infringement  
30 herein, was not invented by the alleged inventors  
31  
32



1 named therein, but was, in fact, derived from in-  
2 formation obtained from defendant itself by Robert  
3 Sell, one of the alleged inventors.

4 B. Defendant began work on a behind the ear  
5 headset in 1961 and during that year a mock-up  
6 headset was made as shown in Defendant's Exhibits  
7 23-29. In the winter of 1961-62 an operating  
8 prototype of this headset was fabricated at Audiotone  
9 in Phoenix, Arizona by Byron G. Landford. This  
10 operating headset was made from an Audiotone Model  
11 77 hearing aid with the microphone and receiver  
12 therein being re-wired to act as a pilot's headset.  
13 A piece of hearing aid pipe was used as the microphone  
14 tube. This unit was used during the winter of 1961-  
15 62 in an Aero-Commander airplane. Work continued on  
16 the behind-the-ear headset with emphasis on cost  
17 reduction. Such further work resulted in a unit  
18 having an external receiver rather than the more  
19 expensive internal receiver used in the Model 77  
20 hearing aid. This first external receiver unit was  
21 built and operated in the spring of 1962 and was  
22 similar to Defendant's Exhibit 33 but included no  
23 hinge. The hinge, as incorporated in Exhibit 33  
24 was first used in May or June of 1962. The hinge  
25 units also included a snap-on tube extending from  
26 the external receiver to the auditory canal of the  
27 wearer (Defendant has located some of these tubes  
28 as well as additional parts for the models since the  
29 deposition of Mr. Sell. Such tubes and parts will  
30 be made available for inspection by plaintiff's  
31  
32

attorney). Several of these units were built and, although none were sold, they were given away and placed in public use in 1962. Among those who actually used the units are Mr. Gail Morris, formerly of Williams, Arizona, present address unknown; Mr. Jim Parker, formerly of Phoenix, Arizona, present address unknown; a Mr. Bohannon, formerly a pilot for Royal Industries in Pasadena, California; present address unknown; John R. Johnson, President of Royal Industries, Inc., Pasadena, California.

Consequently, defendant's own prior public use invalidates the patent.

C. The claims of the patent in suit are considered unpatentable over the following which show the state of the art at the time of the alleged invention:

<u>Patent Number</u>	<u>Inventor</u>	<u>Issue Date</u>
32,854	Bain	July 23, 1861
231,599	McK Dermott	August 24, 1880
286,737	Shepherd	October 16, 1883
299,300	Warth	May 27, 1884
351,209	Seiler	October 19, 1886
376,569	Whitehead	January 17, 1888
518,959	Kolbassieff	May 1, 1894
535,540	Holland	March 12, 1895
835,865	Pieringer	November 13, 1906
1,314,819	Lehman	September 2, 1919
1,541,121	Doble	June 9, 1925
1,570,129	Clarke	January 19, 1926
1,866,043	Konigsberger	July 5, 1932
2,098,402	Reifsteck et al	November 9, 1937

1	2,215,585	Huenlich	September 24, 1940
2	2,337,953	Wirsching	December 28, 1943
3	2,353,070	Pitkin	July 4, 1944
4	2,418,120	Hornickel	April 1, 1947
5	2,485,405	Olney et al	October 18, 1949
6	2,486,267	Dulinsky	October 25, 1949
7	2,498,960	Mullin	February 28, 1950
8	D-159,223	Olson	July 4, 1950
9	2,529,562	Martin	November 14, 1950
10	2,566,313	Cates	September 4, 1951
11	2,586,644	Gilbert	February 19, 1952
12	2,596,351	Weaver	May 13, 1952
13	2,717,932	Rackham et al	September 13, 1955
14	2,730,681	Shaper	February 5, 1957
15	2,882,343	Erickson	April 14, 1959
16	2,904,640	Dreher et al	September 15, 1959
17	2,946,394	Smith	July 26, 1960
18	2,975,244	Lehr	March 14, 1961
19	3,014,998	Simpson et al	December 26, 1961
20	3,031,537	Rose	April 24, 1962
21	3,045,073	Vickerson	July 17, 1962
22	3,097,059	Hoffman	July 9, 1963
23	3,184,556	Larkin	May 18, 1965
24	3,192,321	Nessimbene	June 29, 1965

25 D. The patent is invalid for failing to  
 26 distinctly claim what the applicant regards as the  
 27 invention. Each and every claim calls for the  
 28 microphone tube to touch the cheek of the wearer.  
 29 Each and every claim requires the microphone tube  
 30 to extend from the bottom of the housing. Each and  
 31 every claim requires the receiver tube to extend from  
 32

12  
 1077



1 the top of the housing. Such uniform recitation of  
2 structure makes it clear that such structure was re-  
3 garded as the subject matter of the invention.  
4 Plaintiff's assertion of infringement by defendant's  
5 StarSet indicates that the applicant regards his  
6 invention as something far broader than and entirely  
7 different from the structure recited in these claims.

\* \* \*

6 Interrogatory No. 22: Identify all persons who have  
7 provided assistance in the provision of answers to each of the  
8 foregoing Interrogatories.

9 Answer: These answers were prepared by defendant's  
10 attorney, Thomas O. Herbert, after conferences with Messrs.  
11 Courtney P. Graham, Donald R. Wilson, and Richard F. Fulmer of  
12 defendant corporation and Mr. Byron G. Langford of Audiotone in  
13 Phoenix, Arizona.

14  
15 PACIFIC PLANTRONICS, INC.

16  
17 By Courtney P. Graham

18 Courtney P. Graham  
19 President

20  
21  
22 Interrogatory No. 8 is hereby objected to.

23  
24 Thomas O. Herbert  
25 Thomas O. Herbert  
26 Attorney for Defendant  
27  
28  
29  
30  
31  
32

1 State of California )  
City & ) ss.  
2 County of San Francisco )  
3

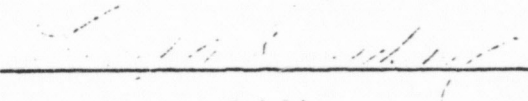
4 COURTNEY P. GRAHAM, being duly sworn, upon his oath  
5 deposes and says:

6 1. I am President of Pacific Plantronics, Inc., a  
7 corporation, and I am the agent of that corporation for the  
8 purpose of making the above answers to Plaintiff's Interrogatories  
9 to Defendant, served on the corporation on or about April 30,  
10 1971 and for making this verification.

11 2. The foregoing answers to Plaintiff's Interrogatories  
12 to Defendant are true according to the best of my knowledge,  
13 information and belief.  
14

15   
16 Courtney P. Graham

17 Subscribed and sworn to before me  
18 this 27th day of May, 1971.

19   
20 \_\_\_\_\_  
21 Notary Public

22 WILLIAM H. DAVIDSON  
23 My Commission Expires Aug. 16th, 1972  
24  
25  
26  
27  
28  
29  
30  
31  
32

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32

IN THE UNITED STATES DISTRICT COURT  
FOR THE NORTHERN DISTRICT OF CALIFORNIA

THE TELEX CORPORATION,	)	
	)	
Plaintiff,	)	Civil Action No. C70-1340 LHB
	)	
v.	)	<u>AFFIDAVIT OF GAIL MORRIS</u>
	)	
PACIFIC PLANTRONICS, INC.,	)	
	)	
Defendant.	)	
_____	)	

STATE OF ARIZONA )  
COUNTY OF COCONINO ) ss.

I, GAIL MORRIS, being duly sworn depose and state as follows:

1. That I am presently a resident of Flagstaff, Arizona and have a place of business at 2114 N. 4th Street, Flagstaff, Arizona.

2. That from some time prior to 1961 and until 1965 I was a resident of Phoenix, Arizona.

3. That while I resided in Phoenix, Arizona I owned a green and white Piper Tri-Pacer airplane for about one year until August 1962, at which time I sold it to an organization named Wings for Christ.

4. That in the winter of 1961 - 1962 or spring of 1962 I was called upon by one Barney Langford to permit the installation of a new headset in my airplane.



1           5. That said new headset was installed in my airplane  
2 for several days during the winter of 1961 - 1962, or spring  
3 of 1962.

4           6. That said headset was operated and tested during  
5 the several days it was installed in my airplane.

6           7. That during said operation and testing I personally  
7 flew my airplane and used said headset to communicate by radio  
8 with said Barney Langford and one other person whose name I  
9 cannot now recall.

10          8. That said headset was self-supporting on my ear  
11 and included a housing which was mounted behind my ear.

12          9. That said headset further included a first  
13 sound conducting tube extending from the top of said housing.  
14 The first sound conducting tube terminated in an ear plug which  
15 was inserted in my ear and through which I heard the radio  
16 transmitted voice of said Barney Langford.

17          10. That said headset further included a second  
18 sound conducting tube extending from the bottom of said housing  
19 and adjustable to a position adjacent my mouth and through which  
20 I spoke to said Barney Langford.

21          11. That said headset appeared to be made from  
22 a standard behind-the-ear hearing aid but with the addition of the  
23 second tube which extended toward my mouth.

24          12. That the radio communications established with  
25 said headset were completely satisfactory.

26

27

28

29

30

31

32

13. That said headset was also satisfactory in that, during the entire time of communication it stayed in operable position without any extrinsic support.

Gail Morris

Subscribed and sworn to before me  
this 21<sup>st</sup> day of June, 1972.

Notary Public

My Commission Expires July 12, 1974

1 FLEHR, HOHBACH, TEST,  
 2 ALBRITTON & HERBERT  
 3 ALDO J. TEST  
 4 THOMAS O. HERBERT  
 5 160 Sansome Street - 15th Floor  
 6 San Francisco, California 94104  
 7 Telephone: 781-1989

8 Attorneys for Defendant

FILED  
 APR 21 1972  
 G. C. IVERSEN, Clerk

9 IN THE UNITED STATES DISTRICT COURT  
 10 FOR THE NORTHERN DISTRICT OF CALIFORNIA

11 THE TELEX CORPORATION, )

12 Plaintiff, )

13 v. )

14 PACIFIC PLANTRONICS, INC., )

15 Defendant. )

Civil Action No. C70 1340 NIS

DEFENDANT'S ANSWERS TO  
PLAINTIFF'S SECOND  
INTERROGATORIES

16 COMES NOW defendant, Pacific Plantronics, Inc., and  
 17 in response to Plaintiff's Interrogatories to Defendant (Second  
 18 Set), served on the 21st day of March 1972, submits as follows:

\* \* \*



1010

5           Interrogatory No. 23: For each claim of the patent  
6 in suit, specify each article or item of prior art that Defendant  
7 intends to rely upon in support of its allegations that such  
8 claims are invalid over any such prior art. In the event more  
9 than three patents or items or articles of prior art are iden-  
10 tified for any such claim, specify with particularity the manner  
11 in which they will be combined to form a basis for such  
12 allegation.

13           Answer: As presently advised, prior art relied  
14 upon by defendant against all claims of the patent in suit  
15 may be divided into three general groups including:

16 GROUP A: Those which show the general combination of a  
17 microphone and a receiver in a headset. This particular group  
18 includes the following patents:

19	231,599	McDermott	8/24/80
20	299,300	Warth	5/27/84
21	835,865	Fieringer	11/13/06
22	1,314,819	Lehman	9/ 2/19
23	1,866,043	Konigsberger	7/ 5/32
24	2,353,070	Pitkin	7/ 4/44
25	2,485,405	Olney	10/18/49
26	2,586,644	Gilbert	2/19/52
27	2,904,640	Dreher	9/15/59
28	3,184,556	Larkin	5/18/65

29 This group also includes Pacific Plantronics own prior art  
30 devices, the MS-43 in its various versions as previously  
31 reported in response to plaintiff's Interrogatory No. 14.  
32

1084 19

1 GROUP B: That prior art which generally shows the use of  
2 acoustic tubes in headsets. This group includes not only the  
3 previously mentioned MS-43 but also the following patents:

4	286,737	Shephard	10/16/83
5	299,300	Warth	5/27/83
6	2,353,070	Pitkin	7/ 4/44
7	2,485,405	Olney	10/18/49
8	2,498,960	Mullin	2/28/50
9	2,566,313	Cates	9/ 4/51
10	2,586,644	Gilbert	2/19/52
11	2,882,348	Erickson	4/14/59
12	2,904,640	Dreker	9/15/59
13	3,184,556	Larkin	5/18/65

14 GROUP C: That prior art which relates specifically to "behind  
15 the ear" type hearing aids. This group includes various versions  
16 of the MS-43 previously stated, together with the following patents:

17	2,882,348	Erickson	4/14/59
18	2,975,244	Lehr	3/14/61
19	3,031,537	Rose	4/24/62
20	3,045,073	Vickerson	7/17/72

21 The combination of the various patents was previously  
22 stated in answer to Interrogatory No. 13 referring specifically  
23 to defendant's patent No. 3,184,556 and plaintiff's patent No.  
24 2,882,348 as examples.

25 Defendant, at this time, is unable to give a specific  
26 correlation to the various elements of the prior art devices  
27 to the elements of the claims in suit because defendant does  
28 not understand the language of the claims when considered with  
29 plaintiff's answers to Interrogatories Nos. 12 through 19. For  
30 instance, in response to defendant's interrogatory No. 13  
31 plaintiff has stated that the tube at the top of defendant's  
32

1 headset (which clearly extends to the mouth) is considered by  
2 plaintiff to extend into the proximity of the ear canal of the  
3 user. This obvious contradiction of terms does not permit  
4 defendant to understand the patent nor to more fully respond to  
5 plaintiff's Interrogatory No. 23.

6 Interrogatory No. 24: Identify the patent applications  
7 and amendments which may have covered all aspects of the design  
8 concepts incorporated in Defendant's Model MS-43.

9 Answer: Defendant made no patent application to cover  
10 the design of its MS-43.

11 Interrogatory No. 25: Identify any such patent appli-  
12 cations that were filed by Royal Industries, Inc. or its Audiotone  
13 Division, covering Defendant's Model MS-43.

14 Answer: Defendant is aware of no patent application  
15 filed by Royal Industries or its Audiotone Division covering the  
16 MS-43.

17 Interrogatory No. 26: Specify the dates of any  
18 alleged public use of Defendant's Model MS-43 headset.

19 Answer: See Defendant's answer to plaintiff's  
20 Interrogatory No. 14. As presently advised defendant's public  
21 use of the MS-43 began in 1962 and continued for at least several  
22 years thereafter.

23 Interrogatory No. 27: Identify any other alleged  
24 public use of the same or similar headsets by or for Defendant,  
25 stating for each, the times and places that each such use  
26 occurred, and the names, home and business addresses, business  
27 positions, employers at the time of such use of any individuals  
28 involved in each of such uses.

29 Answer: As presently advised defendant is aware of no  
30 additional public uses.

31  
32



1           Interrogatory No. 28: State the dates, places, times  
2 addresses and business positions of the individuals from whom  
3 Defendant contends the invention [inventors?] derived any  
4 information relating to the patent in suit.

5           Answer: As presently advised, Robert S. Sell derived  
6 information for the patent in suit from Keith Larkin and  
7 Courtney Graham in or about October of 1962 in Santa Cruz,  
8 California.

9           Interrogatory No. 29: For each act and person named  
10 above, specify the nature of such information.

11           Answer: As presently advised the nature of the infor-  
12 mation was either a model or a mock up of the MS-43 as shown in  
13 the photographs, Defendant's Exhibits D-23 and D-29.

14           Interrogatory No. 30: For each act and person named  
15 in the answer to Interrogatories 8 and 9 [28 and 29?] above,  
16 specify the alleged inventor of such information and the  
17 name of the person to whom it was disclosed.

18           Answer: It is deemed by defendant that there is no  
19 "inventor" of the information derived by Robert Sell since such  
20 information as well as the MS-43 specifically and the device  
21 shown in the patent in suit, was nothing more than the obvious  
22 combination of well known prior art devices. The MS-43 was  
23 designed, however, by one or more of the following: Keith Larkin  
24 Courtney Graham, Byron Langford, John R. Johnson.

25  
26           PACIFIC PLANTRONICS, INC.

27  
28           By \_\_\_\_\_

29           Courtney P. Graham  
30           Chief Executive Officer

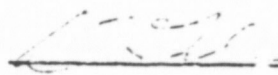
31  
32

1 STATE OF CALIFORNIA )  
City & ) ss.  
2 COUNTY OF San Francisco )

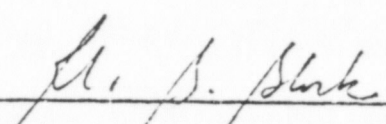
3  
4 COURTNEY P. GRAHAM, being duly sworn, upon his  
5 oath deposes and says:

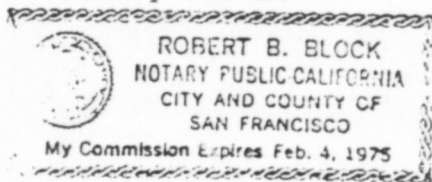
6 Chief  
7 1. I am Executive Officer of Pacific Plantronics,  
8 Inc., a corporation, and I am the agent of that corporation for  
9 the purpose of making the above answers to Plaintiff's  
10 Interrogatories to Defendant (Second Set), served on the  
11 corporation on or about March 21, 1972 and for making this  
12 verification.

13 2. The foregoing answers to Plaintiff's Interrogatories  
14 to Defendant (Second Set) are true according to the best of my  
15 knowledge, information and belief.

16  
17   
18 Courtney P. Graham

19 Subscribed and sworn to before me  
20 this 19<sup>th</sup> day of APRIL, 1972.

21  
22   
23 Notary Public





FILED

JUN 30 1972

C. C. EVENSEN, Clerk

25  
11

IN THE UNITED STATES DISTRICT COURT  
FOR THE NORTHERN DISTRICT OF CALIFORNIA

10	THE TELEX CORPORATION,	)	
11		)	
11	Plaintiff,	)	Civil Action No. C70 1340 RMS
12		)	
12	v.	)	<u>ORDER OF DISMISSAL</u>
13		)	
13	PACIFIC PLANTRONICS, INC.,	)	
14		)	
14	Defendant.	)	
15		)	

Pursuant to stipulation of the parties hereto:

1. This action and the Complaint herein are hereby dismissed with prejudice.
2. Defendant, Pacific Plantronics, Inc., its officers, agents, servants, employees, customers and any other persons acting under, for, or in concern or privity with it are hereby released from all claims, past, present and future, arising under the patent No. 3,280,273 here in suit.
3. This Order shall be binding upon the parties, their officers and agents, and their privies.
4. Each party herein is to bear its own respective costs.
5. Plaintiff herein hereby waives any right of appeal.

Dated: JUN 29 1972 SO ORDERED: [Signature]



1 Stipulated to and approved as to  
2 form and content:

3  
4 THE TELEX CORPORATION

5  
6 By *Carl C. Klein*

Dated: *21 June 1972*

7  
8 CARLSEN, CARLSEN & STURM

9  
10 By *Darren C. Sturm*

Dated: *22 June 1972*

11  
12 NAYLOR & NEAL

13  
14 By *Frank A. Neal*

Dated: *June 27, 1972*

15  
16 PACIFIC PLANTRONICS, INC.

17  
18 By *C. J. ...*

Dated: *June 29, 1972*

19  
20 FLEHR, HOHBACH, TEST,  
21 ALBRITTON & HERBERT

22 By *Thomas O. Herbert*

Dated: *June 29, 1972*

DEFENDANT'S SUMMARY OF DEPOSITION OF  
MERLIN WILLIAM LEONHARDT TAKEN JAN. 31, 1973

Mr. Leonhardt, whose deposition was taken by plaintiff, testified that he has no financial interest in the outcome of this suit. (p. 3)

After high school he was an instructor in basic electronics during a tour in the Navy, then studied electrical engineering at Purdue for two years, and, after working for a time as a sales engineer, joined United Airlines in 1950 as an engineering draftsman, and has been a Radio Engineer for UAL since 1953. (p. 3)

In 1961, Leonhardt's responsibility was to investigate problems with existing aircraft communications systems, and to recommend, obtain and evaluate new equipment. Mr. Austin Trumbull, the communications supervisor, was his superior. (pp. 6-7)

Leonhardt identified a document entitled "Engineering Work Assignment", dated August 25, 1960, as showing that he was assigned at that time to work concerning headsets (p. 7), this assignment being his first specific project concerning headsets. He stated that he canvassed the market to find out if there were any lightweight headset/boom microphone assemblies available, in an attempt to replace the heavy wartime HS-33 headphones pictured in EP 6083, which were used with a handheld microphone. (pp. 9-10)

UAL wanted to reduce the weight of the headphones, which was from a pound to a pound and a half, depending upon the cord, and the handheld microphone was also a problem in that it took one hand away from the aircraft controls. (p. 10) When landing, the co-pilot would usually handle the communications while the pilot flew the plane. (pp. 10-11) Leonhardt explained that the cord of the HS-33 is longer than it is pictured in EP 6083 and was constantly dropping on the floor and being cut on the seat tracks, thus raising maintenance costs. (p. 12)

Also, when the HS-33 receiver elements were both in place over the ears, it was difficult to hear cockpit conversation, and the crew members would often use only one earphone in place, to be able to hear each other. (p. 13)

Leonhardt stated that he does not know of any safety problem in having a boom microphone in front of the mouth,



1018

but there was a little interference when quickly donning an oxygen mask. (pp. 13-14)

He also stated that the UAL Flight Operations group in Denver had done a little investigating on their own before contacting Engineering, and had tried the headset telephone operators were using at the time, the Western Electric WE-52. This was a single earphone unit, with a boom mike, but it was rejected because it would not stay on the head under movement. (p. 14) They also tried a Telex unit that looked almost the same as the WE-52, and it was unsatisfactory for the same reasons. (p. 15)

Leonhardt's group issued a request for information to UAL's Purchasing Department who wrote letters to some 20-25 vendors (p. 15), and he identified a memorandum report, dated December 19, 1960, on the responses received. The report states that of the 19 vendors who replied, 12 stated that they could not meet the requirements for one reason or another, and Leonhardt explained that the requirements specified were lightweight and transistorized, with a dynamic microphone. (pp. 16-18)

Leonhardt identified a sample headset (EP 6081) received from Airmed, Ltd., as being a headset/boom microphone assembly called "Airlite" which weighed about a pound or so. (p. 18) The microphone was a noise-cancelling type and had to be placed between a quarter and half inch from the mouth to work normally. The boom pivoted up out of the way, and, therefore, did not present any difficulty in donning an oxygen mask, which had its own built-in microphone. (pp. 19-20) UAL thought the Airlite was a good headset for the state of the art at the time, but it was too clumsy. (p. 20)

Also, he identified a sample headset (EP 6082) from Carter Engineering, as consisting of muffed earphones and a boom mike. This unit weighed about the same as the Airlite, and United did not pursue it, for the same reasons. (pp. 22-3)

He testified that he believes they received a Telex unit, which was basically the Telex Twinset earphones with a pivot boom added to one side and a large mike. (pp. 23, 26) He testified that it was close, but still not what they were looking for; it was half the weight of anything else they saw, between a quarter and a half pound. (p. 23) UAL received a prototype of this unit, as it was not actually marketed until later. (p. 24)

Leonhardt then located a drawing of a headset from his files that he felt was a close approximation of the Telex



unit. It was shown in an Attachment I to ARINC Characteristic No. 535, entitled "Lightweight Headset and Boom Microphone" issued March 25, 1957. (p. 24) He explained that ARINC is Aeronautical Radio Inc., which collectively represents all of the airlines' requirements for equipment aboard standard commercial aircraft, and that the "characteristics" are specifications for any and all vendors to follow in manufacturing equipment for the airlines, and do not necessarily relate to an existing product, although they might. (pp. 24-5) Leonhardt does not know if there was a headset on the market in 1957 which looked like the one in Attachment I, but if there was, he did not see it until after he started his investigation. (p. 25)

Leonhardt stated that UAL's reaction to the Telex headset was quite favorable in that they liked it for its light weight; it was relatively rugged and quite comfortable to wear. The only real objection they had was the large boom microphone in front of the pilot's mouth. Their objection was just from a mass standpoint; it would not stay in place if you moved your head around. (p. 25) He stated that the headset had acoustical tubes from the receiver pads to the ear, but not an acoustic voice tube. (p. 26)

Returning to the December 19, 1960 memo report, Leonhardt stated that UAL never received a sample unit from Telephonics Corp., only brochures from the defendant Roanwell, which did not disclose any new lightweight assemblies, and a letter and some other information from the Holmberg Company, which showed the Holmberg unit to be too bulky, and a sample was never requested. (pp. 26-8)

Leonhardt testified that many years later he came into contact with the Amplivox Minilite which employs an acoustical tube microphone arrangement and an acoustical ear tube, with transducers in a rectangular housing having a clip on either side, to be clipped onto a headband or glasses, and the same is true as to an Electro-Voice unit (EP 6084). (pp. 29-31)

Leonhardt stated that during the time of his investigation Mr. Trumbull came upon Plane-Aids when he was trying to obtain a lightweight headset boom microphone assembly in the shape of a pair of spectacles. (p. 32) Trumbull came across a Plane-Aids promotional flyer on a Japanese radio receiver in a spectacle frame (EP 5642), and he asked Plane-Aids to stop by and see if they would be interested in manufacturing or developing a lightweight assembly similar to the radio receiver spectacles. (p. 33)

At the first meeting with Plane-Aids, on April 25, 1961, Trumbull asked Mr. Larkin, Plane-Aids' president, if he would be interested in developing a lightweight headset boom-mike assembly in the shape of the radio spectacles, and Larkin was quite interested and agreed to try to develop one without a joint development contract with UAL. (p. 34)

Leonhardt testified that Plantronics (formerly Plane-Aids) subsequently produced a headset acceptable to UAL, similar to the Plantronics current model MS-50, marked as Ex. EP 6100 (p. 36), and that this headset is used in all of UAL's jet aircraft. (p. 37)

Leonhardt stated that the Plantronics headset solved the problems and satisfied the needs of UAL, since it was lightweight, one to two ounces at most, and not bulky, and it was installed with the amplifiers mounted overhead, which kept the cords off the floor. Also, it allowed the wearer to talk without taking his hands off the flying controls, and it covered only one ear to allow the wearer to hear cockpit conversation. (p. 38)

Leonhardt explained that to don an oxygen mask while wearing an MS-50, one pushes the acoustic voice tube out of the way, dons the oxygen mask, and then switches the mike selector switch from boom to mask. (p. 39)

Leonhardt stated that some people complained about wearing a headband, and some refused to plug anything into their ears, in which case UAL has a personal earmold made. (p. 41) About 15% complained the first year or two, but as the pilots became accustomed to the change in headsets, and as younger pilots came in, there were fewer complaints and today there are practically none. (p. 41)

Mr. Leonhardt stated that the components for the MS-50, such as the acoustical tubes, ear tip and small transducers were available through hearing aid vendors prior to the advent of the MS-50. Also, he stated that the first development units had acoustical feedback problems, but the transducers were very well protected and would not break if subjected to shock, and the only big problem UAL had was with the cable, which was cured by bend relief tubing. (pp. 41-2)

Mr. Leonhardt identified a memo dated September 22, 1961, which refers to a meeting on September 21 at which Larkin demonstrated the clip-on capsule version of the MS-50 (EP 5658).



1081

On cross examination, Mr. Leonhardt testified that the engineering work assignment dated August 25, 1960 is essentially the beginning of the program at UAL to find a boom microphone headset. (p. 45) Leonhardt stated that at the time UAL needed about 500 to 600 headsets to maintain its system, until other aircraft were added, but he then agreed to the original estimate of approximately 250 units set forth in a UAL document (EP 7002-3). (p. 46)

Leonhardt stated that he was present at the first meeting with Larkin of Plane-Aids, and he concurred with the summary of the meeting in Trumbull's note of April 25, 1961, on one copy of the UAL April 17, 1961 letter to Plane-Aids. (p. 50)

Leonhardt testified that in the Plane-Aids radio sunglasses, the radio is built into the bow of the sunglasses and sound is conveyed from the bow to the ear by a hearing aid tube which is an acoustical tube. (p. 51)

Leonhardt then identified letters from Larkin to Trumbull, dated June 2 and 16, and two photos showing a spectacle boom-mike headset assembly, with a write-up entitled "Minitel", as showing the first submission by Plane-Aids subsequent to the April 25 meeting. (pp. 52-3)

He also identified two UAL photos marked 18000A and 18000B (Ex. 70063 & H), as showing the first prototype headset from Plantronics, which was delivered to UAL by Keith Larkin, Courtney Graham and Bill Bowman on July 3, 1961. (pp. 56-7) Leonhardt stated that Bowman was hired by Plantronics on an extra-curricular basis, while he worked for Lockheed, to help them develop a headset. (p. 58)

Leonhardt described the first prototype headset as using thick bowed spectacles with a microphone transducer bracketed to one bow, and a short acoustic voice tube, together with another acoustical tube from the bow to the ear. He stated that the ear tube in this headset is essentially the same as the one on the earlier boom-mike mock-up (7006G & H) and on the Plane-Aids radio sunglasses. (p. 59)

He identified a list of suggested changes in the first prototype, and stated that half were in Trumbull's handwriting and half in his. (p. 60)

Leonhardt then identified documents relating to a second prototype (EP 7008A-H), and described the second prototype as a pair of eyeglasses with the mike within the left bow and a pivoting tube extending from the left bow to the



mouth, together with a standard acoustical ear tube similar to the others. (p. 63) He stated that the second prototype was flight tested on August 4, 1961, with Larkin and Bowman on board as observers. (pp. 64-5)

Leonhardt testified that the headset shown on page 8 of the 1957 ARINC report shows two alternatives for conducting sound to the ear, one of which is an acoustic tube that plugs into the ear, and that these were known alternatives in 1957. (pp. 67-8)

Also, he testified that the Telex Twinset used an acoustical tube. (p. 68) When asked whether the headset Plantronics supplied was essentially a modification of the Twinset to include a voice acoustical tube, he said "Well, that is hard to say. They both use acoustical tubes, yes. The Plantronics does use an acoustical microphone tube as well as a receiver tube, yes." (p. 68)

Leonhardt did not evaluate any other headsets with acoustical voice tubes during the UAL headset program which began in August of 1960, and he did not know of any others during that period. (pp. 68-9)

On further examination by plaintiff, Mr. Leonhardt stated, as to Plantronics' purpose in hiring Mr. Bowman, that Larkin and Graham were not electronics types and needed help to devise something that would work in an electronic system. While they had their own airplane to test a unit if they ever found one, they first had to have somebody that could devise one. (p. 69) Leonhardt stated that Bowman built the first prototype with the short acoustic tube but he couldn't say whose idea it was; he doesn't know. (pp. 69-70)

1003  
COPY

IN THE UNITED STATES DISTRICT COURT  
FOR THE SOUTHERN DISTRICT OF NEW YORK

--000--

PACIFIC PLANTRONICS, INC.,

Plaintiff, }

vs. }

ROANWELL CORPORATION,

Defendant. }

No. 72 CIV 1625

DEPOSITION OF AUSTIN FAIRCHILD TRUMBULL

February 1, 1973

SOCRATES NICHOLSON

HART & HART

(SINCE 1927)

OFFICIAL REPORTERS AND NOTARIES  
SAN FRANCISCO 5

52 SECOND STREET

DOUGL

DEFENDANT'S  
EXHIBIT

NO.

NN

1097



WS#16093

IN THE UNITED STATES DISTRICT COURT  
FOR THE SOUTHERN DISTRICT OF NEW YORK

--oOo--

PACIFIC PLANTRONICS, INC.,

Plaintiff, }

vs. }

ROANWELL CORPORATION,

Defendant. }

No. 72 CIV 1625

BE IT REMEMBERED that, pursuant to Notice of Taking  
Deposition and Subpoena, attached hereto, and on Thursday,  
the 1st day of February 1973, commencing at the hour of 2:00  
o'clock p.m. thereof, at the Trumbull residence, 1073 Tehama,  
Menlo Park, California, before me, SAM HOUSTON, a Notary  
Public in and for the City and County of San Francisco,  
State of California, personally appeared

AUSTIN FAIRCHILD TRUMBULL,

called as a witness on behalf of the plaintiff, who, being by  
me duly sworn to testify the truth, the whole truth and  
nothing but the truth herein, was thereupon examined and  
testified as hereinafter set forth.

- - -

Messrs. ARNOLD, WHITE & DURKEE, by PAUL M. JANICKE,  
Esq., 2050 Post Oak Tower, Houston, Texas 77027, and

Messrs. FLEHR, HOHBACH, TEST, ALBRITTON & HERBERT, by  
THOMAS O. HERBERT, Esq., 160 Sansome Street, San Francisco,

52 SECOND STREET

SOCRATES NICHOLSON  
AND ASSOCIATES  
OFFICIAL REPORTERS AND NOTARIES  
SAN FRANCISCO 94105

(415) 362-0118



1 California 94104, appeared as ccounsel on behalf of the  
2 plaintiff.

3 Messrs. COOPER, DUNHAM, CLARK, GRIFFIN & MORAN, by  
4 CHARLES W. BRADLEY, Esq., 330 Madison Avenue, New York, New  
5 York 10017, appeared as counsel on behalf of the defendant.

6 - - -

7 MR. JANICKE: I would offer to stipulate as we did  
8 yesterday that this deposition is taken in accordance with  
9 the Federal Rules of Civil Procedure, with no exceptions  
10 thereto except the following: The transcript of the deposi-  
11 tion can be signed before any Notary, and counsel will keep  
12 custody of the exhibits and we will file them with the Court  
13 with an appropriate stipulation.

14 MR. BRADLEY: That's fine with us. I wonder if we might  
15 stipulate all of the documents that were marked yesterday  
16 as being taken from United Airlines' files, and all those  
17 which are marked today might be stipulated to have come from  
18 those files and to be kept in the regular course of business,  
19 subject to any particular objection that's made to any  
20 particular document?

21 MR. JANICKE: That's so stipulated.

22 - - -

23 Whereupon,

24 AUSTIN FAIRCHILD TRUMBULL,  
25 called as a witness on behalf of the plaintiff, having been  
26 duly sworn by the Notary Public to testify the truth, the whole

1 truth and nothing but the truth herein, was examined and  
2 testified as follows:

3 EXAMINATION BY MR. JANICKE:

4 Q. Mr. Trumbull, before we start I think I will put before  
5 you some photographs which are identified as EP 5650 to 5659.

6 A. What does "EP" stand for?

7 Q. That's our coding system.

8 These are some photos of Plantronics, and they show some  
9 early versions of the Plantronics headsets--mock-ups and  
10 prototypes--and here are some smaller photos of a similar  
11 nature.

12 A. Yes.

13 Q. Well, as we go along if there are any questions that I  
14 ask which you can answer more easily by referring to any of  
15 the photographs, just feel free to do that.

16 Would you state for the record your name and present  
17 address?

18 A. My full name?

19 Q. Yes.

20 A. My full name is Austin Fairchild Trumbull, T-r-u-m-b-u-l-l.  
21 I live at 1073 Tehama Avenue, Menlo Park, California.

22 Q. What is your present occupation?

23 A. I'm a retired engineer.

24 Q. And is this proceeding today in accordance with a  
25 Subpoena that was recently served on you by Mr. Herbert?

26 A. Yes.



1 Q. Would you outline for us, please, your technical  
2 educational background beginning after high school?

3 A. I did not attend any formal college or university. ~~My~~  
4 ~~education is--I'm self-educated insofar as well,~~ except for  
5 correspondence school, of course, in Electrical Engineering.  
6 My avocation since my early childhood has been electrical  
7 and electronics, and even back to the "wireless." I built my  
8 first wireless set in 1915, so you might say I could have  
9 written some of the textbooks instead of studying them.

10 Q. What correspondence courses did you take, can you recall?

11 A. Electrical engineering.

12 Q. And was it a particular school or--

13 A. L. L. Cook School of Engineering, Chicago, Illinois.

14 Q. And did you receive a certificate of some kind for that  
15 work?

16 A. Yes.

17 Q. Would you describe for us your technical employment  
18 background, what jobs you have had and what the responsibili-  
19 ties were on each of them?

20 A. How far back do you want me to go?

21 Q. Well, when did you first become employed in some  
22 technical work?

23 A. Well, I could go way back to childhood where I wired  
24 houses and so on, but let's start, say, with 1930 when I went  
25 to work for United Airlines. I went to work as a radio  
26 mechanic, working in the laboratory in Oakland.



1 easy to wear.

2 No, I don't think anybody has gone that far. I think  
3 Telex had probably gone as far as anybody had, but this was  
4 still not practical for us.

5 Q. Could you describe what you mean by the Telex unit?

6 A. Well, they were generally smaller. They had--~~they had~~  
7 approached hearing aid stuff, but the mounts and everything  
8 ~~WERE~~ ~~not~~ so much bigger. They were, let's say, halfway between  
9 the Minitel and what we were using, but lightweight headsets.  
10 They had some kind of a stethoscope (indicating) looking  
11 stuff that people bought, ~~but they didn't~~--if I remember, we  
12 contacted them, too, and they were not interested in building  
13 anything like we wanted. I think most of them weren't  
14 interested not because they were dumb but because they didn't  
15 see any market. If they sold five for every airplane in the  
16 world they still wouldn't have a market or enough to bother  
17 with, compared with the consumer market. You know, the  
18 airplane industry isn't too big. You sell 500 ~~of~~ something,  
19 ~~but~~ that saturates the market, pretty near.

20 Q. I have one last question. I would like you to identify,  
21 if you can, from the United files what I believe is the pair  
22 of mock-ups that you put together to show people generally  
23 what you had in mind.

24 A. ~~Uh-huh~~ <sup>YES</sup> (affirmative).

25 Q. And they are identified as--

26 MR. JANICKE: Do you have clear ones of these, Charlie?

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26

Q. During this development in the period of 1960, '61 and '62, were there other headsets that you tested that had an acoustical voice tube?

A. No.

Q. Did you know of any others at the outset of that program in 1960?

A. Never heard of anybody using the acoustical tubes for a microphone. Like I said, Telex used one for ordinary hearing.

Q. Was that in the Telex twin set?

A. <sup>YES</sup>  
~~Yes~~ (affirmative).

MR. BRADLEY: I have no further questions.

MR. JANICKE: I have nothing further.

(Whereupon, the taking of the deposition was concluded.)

\_\_\_\_\_  
(Signature of Witness)

\_\_\_\_\_  
(Date of Signature)

Subscribed before me this \_\_\_\_\_  
day of \_\_\_\_\_ 19 \_\_\_\_.

\_\_\_\_\_  
Notary Public

52 SECOND STREET

SOCRATES NICHOLSON  
AND ASSOCIATES  
OFFICIAL REPORTERS AND NOTARIES  
SAN FRANCISCO 94105

(415) 352-0118



IN THE UNITED STATES DISTRICT COURT  
FOR THE SOUTHERN DISTRICT OF NEW YORK

---o0o---

PLANTRONICS, INC., etc.,

Plaintiff

vs

ROANWELL CORPORATION,

Defendant

NO. 72 CIV 1625

DEPOSITION OF

JEAN C. CHOIGNARD

---o0o---

Olga Kaye & Associates  
Court Reporters—Notaries  
85 West Santa Clara Street  
San Jose, California

EX. 00

1104



## BE IT REMEMBERED:

That, pursuant to Notice and/or Oral Stipulation of taking deposition, and at the time and place stated herein, the deponent personally appeared; and being by the Notary Public first duly sworn, was examined as a witness in the above-entitled cause.

## STIPULATIONS:

It is stipulated that said deposition may be taken before a Notary Public who is a disinterested person and not interested in any way in the case or any of the parties involved, and is not employed by nor related to any of counsel.

It is further stipulated that said deposition is taken under all of the appropriate sections of the Evidence Code and the Code of Civil Procedure of the State of California.

It is further stipulated that said deposition may be used with the same full force and effect if not signed as though it were signed, assuming the witness has had reasonable opportunity to read and sign said deposition.

It is further stipulated that all objections, except as to the form of the question, are reserved to the time of the trial.

It is further stipulated that in the event the witness refuses to answer any questions, that (1) the Notary has instructed him to answer, and (2) the witness still refuses to answer on the advice of counsel.

1 Date: November 8, 1973.

2 Time: 1:45 o'clock p.m.

3 Place: Office of Limbach, Limbach &  
4 Sutton, Room 318, 2600 El Camino  
5 Real, Palo Alto, California.

7 APPEARANCES

8 Paul M. Janicke, representing the law firm of Arnold, White  
9 & Durkee, 2100 Transco Tower,  
10 Houston, Texas, is present on  
11 behalf of the Plaintiff.

12 Lester T. Clark, representing the law firm of Cooper, Dunham,  
13 Clark, Griffin & Moran, 330  
14 Madison Avenue, New York, New  
15 York, is present on behalf of the  
16 Defendant.

17 ---oOo---

18 JEAN C. CHOIGNARD,

19 being first duly sworn to the Notary Public to tell the  
20 truth, the whole truth, and nothing but the truth, testified  
21 as follows:

22 MR. JANICKE: I would like the record to show  
23 that Mr. Chognard showed me yesterday the files he had that  
24 might correspond to the documents requested in the subpoena  
25 which was served on him. As in the other depositions of  
26 attorneys, I have asserted privilege as to correspondence

1106

1 between Mr. Chognard and there are also some letters from  
2 Mr. Chromy to Mr. Larkin or Mr. Graham in their capacities as  
3 officers of Plantronics, and on behalf of Plantronics I have  
4 asserted the attorney-client privilege and have objected to  
5 production of those documents, but the rest of Mr.  
6 Chognard's file I have delivered to Mr. Clark.

7 THE WITNESS: I would like to add one thing.  
8 This file was not in my possession, it was in the possession  
9 of Al Test, and I asked him to show it to me.

10 EXAMINATION BY MR. CLARK:

11 Q Would you give your name and address?

12 A Yes. Jean C. Chognard.

13 Q You are a patent attorney? A Yes.

14 Q By whom are you employed?

15 A Hewlett Packard Company, Palo Alto, California.

16 Q How long have you been employed by them?

17 A Since January, 1958.

18 Q Are you a member of the California Bar? A Yes.

19 Q Since when? A I believe '59.

20 Q You understand that this deposition is being taken in  
21 connection with a lawsuit brought by Plantronics, Inc. against  
22 Roanwell Corporation? A Yes.

23 Q You are appearing in response to a subpoena?

24 A That's right.

25 Q The subpoena called for the production of certain docu-  
26 ments, and in response to that subpoena you have brought us

1107



ear tube. weren't such tubes well known as standard pieces

3

1 the prosecution file of the Larkin Patent application,  
2 Serial Number 158463 which resulted in the issuance of the  
3 Larkin Patent Number 3,184,118 -- 3,184,556, excuse me. The  
4 numbers are faint on there. The file also includes a  
5 considerable amount of correspondence. It is from this file  
6 that Mr. Janicke has removed certain papers which he  
7 considered to be privileged. I would like to take a minute  
8 and review what is in this file, if I may.

9 I am returning the application file brought by Mr.  
10 Chognard to him. I have no interest in any of the papers  
11 remaining in it.

12 Q (By Mr. Clark) One of the patents in suit is the  
13 Larkin Patent Number 3,184,556, and I note from the file  
14 history that it was filed by the firm of Allen and Chromy in  
15 December, on December 11, 1961. In September of 1962 a  
16 paper was filed revoking their power of attorney and  
17 appointing you in their place, is that correct?

18 A If it is in the file it must be correct. I have no  
19 present recollection of that.

20 Q Well, here is a photographic copy of the Patent Office  
21 file history which has been marked Larkin Exhibit Number 9  
22 for identification. You can readily verify that.

23 A Yes, I was appointed attorney in March of 1963.

24 Q Do you know why Allen and Chromy's power of attorney  
25 was revoked and you were substituted?

26 A I remember that I believe a Mr. Harold Buttner, who is

#2-A

1108

1 one of our Directors and who had an investment in Pacific  
2 Plantronics or Plantronics at the time, asked me to take a  
3 look at this application, which I did. And he asked me to  
4 take over and prosecute it. I'm not absolutely positive it  
5 was Harold Buttner but I think it was.

6 Q Was this the first time you represented Mr. Larkin or  
7 Pacific Plantronics? A Yes.

8 Q Do you remember when you were first contacted concerning  
9 this matter? A No, I don't.

10 Q Did you have any contacts with anyone at Allen and  
11 Chromy concerning this matter?

12 A I may have told them to send me the file but I don't  
13 recall any discussion with them.

14 Q And you don't know with whom you had the contact?

15 A No, I don't remember.

16 Q Who was your principal contact at Plantronics concerning  
17 this matter?

18 A It was Keith Larkin, the inventor.

19 Q Did you have contact with any other people at  
20 Plantronics?

21 A I recall writing at one time to somebody else, I think,  
22 who took over Larkin's job when he left or I ceased having  
23 discussions on the phone with him.

24 MR. JANICKE: Courtney Graham?

25 THE WITNESS: Courtney Graham.

26 Q (By Mr. Clark) What action did you take once you were

1109

1 retained to handle this application?

2 A I suppose I read it, and I will have to look at the file  
3 because again I don't remember.

4 Well, there was a Office Action on June 11, 1963 and  
5 from the record it looks as though I filed an amendment in  
6 December of 1963.

7 Q Well, did you do anything as the result of the review  
8 of the application before that first action was received?

9 A Sometime during the prosecution I had a discussion  
10 with somebody who worked at Stanford Research Institute and  
11 whose name escapes me.

12 Q Would that be Mr. Dennis? A Possibly.

13 Q I will dig out a first name.

14 MR. JANICKE: Arnett.

15 Q (By Mr. Clark) Arnett? A I don't know.

16 Q Did you look into the question of whether the correct  
17 inventor had been named in the application?

18 A No.

19 Q Did the name of William Bowman ever come to your  
20 attention? A Yes.

21 Q As being one who was claiming to be the inventor?

22 A I am aware that there was a lawsuit between Mr. Bowman  
23 and I believe Pacific Plantronics.

24 Q When did Mr. Bowman's name come to your attention?

25 A It must have been around that period.

26 Q How did it come to your attention? Who called it to

1110



1 your attention?

2 A I believe that it was Keith Larkin.

3 Q Did you have any discussion with Mr. Larkin at the out-  
4 set as to what he considered this invention to be?

5 MR. JANICKE: I do not object to the question as  
6 to whether there was a discussion, but if there was such a  
7 discussion, I object to the witness revealing the contents.

8 THE WITNESS: We had several discussions.

9 Q (By Mr. Clark) What did you understand the invention  
10 to be?

11 MR. JANICKE: No objection to that question, if the  
12 witness can recall.

13 THE WITNESS: The device that Mr. Larkin was  
14 interested in is the device that is described in the patent  
15 application. The invention, as I recall, that we finally  
16 zeroed in was the provision of the two tubes that come from  
17 the little block containing the electronics.

18 MR. JANICKE: Are you referring to the capsule  
19 tip --

20 THE WITNESS: Yes.

21 MR. JANICKE: -- of the patent application?

22 THE WITNESS: Of the block containing the elec-  
23 tronics, yes.

24 Q (By Mr. Clark) And the two tubes or what have come to  
25 be termed the voice tube, twenty-six and the ear tube,  
26 twenty-nine? A That's correct.

1111

1 Q Mr. Chognard, referring to the Larkin file history, I  
2 note that at the time you were appointed Larkin's counsel  
3 the claims pending in the case all referred to only one  
4 acoustic tube which extended from the wearer's mouth to the  
5 microphone. Do you know whether Larkin considered his  
6 invention to encompass a headset with just a single acoustic  
7 tube as a voice tube? A I have no idea.

8 Q After you took over there was a Patent Office Action  
9 which is dated June 11, 1963. Do you recall what you did  
10 when you received the action?

11 A I believe it is around that time that I consulted this  
12 acoustical expert from Stanford Research Institute, whose  
13 name still escapes me.

14 Q Did you order copies of the cited references?

15 A Yes.

16 Q Did you know of these references before then?

17 A Now, this is going back ten years. I think a search  
18 had been made and I may have known of some of them. I don't  
19 recall. I think there were some patents in the file. I  
20 couldn't tell you which ones.

21 Q What did you do after you received the references?

22 A I wouldn't say I read them cover to cover, but I looked  
23 at them and there was one which showed a single tube that I  
24 recall, and I think it was Dreher, D-r-e-h-e-r. And there  
25 was a little funnel-shaped thing at the far end of the voice  
26 tube.

1112

1 Q Excuse me just a second. Here's a copy of Dreher.

2 A That's the one.

3 Q That is Dreher Patent Number 2,904,640. Did you send  
4 those references to Mr. Larkin?

5 A I don't recall. I know that I saw him probably several  
6 times. One instance I recall very well because he invited  
7 me to fly to Santa Cruz in his private plane, which I  
8 respectfully declined. We had met for lunch at the Palo  
9 Alto Airport. I also recall discussing with him the hiring  
10 of the Stanford Research Institute acoustical man.

11 MR. CLARK: I ask that the Dreher et al Patent  
12 Number 2,904,640 be marked for identification as Chognard  
13 Deposition Exhibit 1.

14 (Whereupon, the document above-  
15 referred to, being Dreher Patent  
16 Number 2,904,640 was marked  
Chognard Deposition Exhibit Number  
1 for identification.)

17 MR. CLARK: And I ask that this Rackham, et al  
18 Patent Number 2,717,932 be marked for identification as  
19 Chognard Deposition Exhibit 2.

20 (Whereupon, the document above-  
21 referred to, being Rackham  
22 Patent Number 2,717,932 was  
23 marked Chognard Deposition  
Exhibit Number 2 for  
identification.)

24 MR. CLARK: The third cited reference, which is  
25 Olney, O-l-n-e-y, et al, Number 2,485,404, was marked for  
26 identification yesterday as Larkin Exhibit Number 58.

1113



1 Q (By Mr. Clark) The Olney, et al Patent shows an ear  
2 muff headset with an acoustic voice tube, does it not?

3 A It looks that way, yes.

4 Q The acoustic tube is there shown as two separate  
5 passages for noise cancellation purposes, is it not?

6 A I'd have to read it. It looks like there are two  
7 different tubes, fifteen and sixteen, but I can't tell  
8 whether they are for noise cancellation.

9 Q It is stated right in the application. I can probably  
10 find it rather quickly.

11 A'though he doesn't use the phrase, "noise cancellation",  
12 if you will read the paragraph beginning at the bottom of  
13 column five at line sixty-seven or sixty-eight, the function  
14 of blocking out distant sounds is described there, is that  
15 correct?

16 A You mean the paragraph starting on line sixty-seven?

17 Q That's right.

18 A It talks about the dipole microphone. I don't know  
19 what the dipole microphone is.

20 Q Well, the noise cancellation feature is of second ary  
21 interest here. Let's pass it and go on.

22 The Dreher Patent shows an ear mold headset with an  
23 acoustic voice tube, does it not?

24 MR. JANICKE: Object to the question, to the form  
25 of the question, as leading.

26 THE WITNESS: What did we call the tube, twenty-six

2114

1 and twenty-nine?

2 MR. CLARK: I think we just called --

3 THE WITNESS: The voice tube and the ear tube?

4 MR. CLARK: Yes.

5 THE WITNESS: Well, it shows a voice tube of some  
6 kind, twenty-one.

7 Q (By Mr. Clark) . And an earpiece that is intended to fit  
8 within the ear? A I believe so, yes.

9 Q The voice tube communicates with a transducer, number  
10 sixteen, so that sound passing through the voice tube can  
11 impinge on the transducer?

12 A Is this the question you are asking me?

13 Q Is that not a correct statement of what the Dreher  
14 Patent shows?

15 A I'd have to read it. I don't recall it. It says the  
16 tube, twenty-one, is arranged to extend forwardly and  
17 terminates adjacent the lips of the wearer, so one end of  
18 tube twenty-one is close to the lips and the other end -- it  
19 says the sounds are conducted both through the tube twenty-  
20 one from the lips of the wearer and also through the ear  
21 canal to the internal passage eighteen of the plug-like body  
22 ten where the ear and mouth transmitted signals or sounds  
23 are combined and impressed upon the sound-sensitive element  
24 of the transducer sixteen.

25 Q Referring you again to Olney, et al, Number 2,485,405,  
26 he shows tubes fifteen and sixteen extending from a

1115

1 mouthpiece seventeen to cavities on the opposite sides of a  
2 diaphragm eleven. The description begins in column three  
3 about line sixty-five. Here is Olney, et al. The diaphragm  
4 eleven is hidden over here in Figure 10. The other parts  
5 that I mentioned can be readily seen in Figure 1.

6 MR. JANICKE: Is there a pending question?

7 MR. CLARK: I thought there was. Would you review  
8 the situation?

9 (The record was read by the reporter.)

10 MR. CLARK: Off the record.

11 (Discussion off the record.)

12 MR. CLARK: We had a long, rather involved  
13 question there before the interruption.

14 THE WITNESS: I don't remember that it was a  
15 question.

16 Q (By Mr. Clark) Well, I was just about to add on the  
17 end was that a correct statement of what was in the patent?

18 A I think so. You know, the patent speaks for itself  
19 and I haven't seen these things for something like ten years.

20 Q That was Olney, et al we were speaking about.

21 A Whatever the patent says, I'm sure it shows it.

22 Q Each of these patents, each meaning Olney, et al and  
23 Dreher, et al, shows a headset including an acoustic tube  
24 connected to a transducer and were both in the prior art at  
25 the time of the Larkin invention, is that correct?

26 A Would you repeat the question, please?

1116



1 (The question was read by the reporter.)

2 MR. CLARK: Off the record.

3 (Discussion off the record.)

4 MR. JANCKE: I think I would like to have any  
5 further elaboration by Mr. Clark on the record. He seemed  
6 to me to be telling the witness what is shows, and if the  
7 witness is going to base his testimony on Mr. Clark's  
8 recitations, I would like the record to show that.

9 MR. CLARK: We are just doing this primarily to  
10 save time. I am sure the witness could figure it out for  
11 himself, but the Olney, et al disclosure is twelve columns  
12 and gets rather involved.

13 Q (By Mr. Clark) The transducer is described as an  
14 electromagnetic element five. Well, wait a minute. "As  
15 herein illustrated, the microphone unit two, preferably of  
16 the electromagnetic type, comprises an electromagnetic  
17 element six and the microphone capsule six of aluminum alloy  
18 on which this element is mounted. This electromagnetic  
19 element includes a pair of spaced pole pieces seven."

20 A All right. Now, the question, as I remember it, is  
21 did both Dreher and Olney show a transducer and a voice tube?

22 Q That's right.

23 A The answer to that question is yes, they both did.

24 Q What did you decide to do in connection with the Larkin  
25 application after studying these references?

26 A This, I believe, is when I hired the consultant at SRI.

1117

1 Perhaps I should give you a little more background, if there  
2 is no objection. I had met Keith Larkin before all this,  
3 I think. I was then a member of an investment group and  
4 Keith Larkin at the time was interested in raising some money,  
5 presumably to start a company to sell his device. And Keith  
6 was speaking in terms of a very light headset for pilots'  
7 use. He was interested in something that could easily fit  
8 with an oxygen mask, and, as I recall, I wasn't interested  
9 in putting any money in it because there is a limited  
10 number of pilots in the United States, and the entire  
11 emphasis was one of comfort for the user. It was only later,  
12 I think, that he realized or Pacific Plantronics realized  
13 that there was a substantial market in the telephone industry.  
14 And part of the emphasis, I guess, that was put on this  
15 device was really a matter of comfort. So I wasn't  
16 terribly impressed by Cluey at the time because it was a  
17 rather bulky device. I do recall very well the Dreher  
18 reference because it was smaller than any of the other two  
19 references, as I recall.

20 Q To return to my question, what did you decide to do  
21 after studying those references?

22 A We hired this expert and asked him whether there was  
23 some relationship between the acoustical phenomena in the  
24 Larkin device -- could you read the beginning of that  
25 sentence?

26 (The answer was read by the reporter.)

1118

1 THE WITNESS: -- that was different from anything  
2 that had been done before, and we couldn't pinpoint anything.  
3 I approached him from the standpoint of thorough ignorance  
4 of acoustics and I wanted to know whether there was a  
5 quarter-way phenomena or something that made a difference.  
6 And he didn't come up with anything. So we went back to  
7 what Keith Larkin had always talked about, which was the  
8 comfort from the point of view of the user.

9 Q (By Mr. Clark) And how did you amend the claim to dis-  
10 tinguish over those references?

11 A As I recall, the significance to me, the difference  
12 between Larkin and Dreher is that Dreher had a rather  
13 bulky plug that fits into the ear, something he calls an ear  
14 plug body, where, in the Larkin device the transducers  
15 are located in a separate little box and there is a tube  
16 twenty-nine which goes from the little box to the ear of the  
17 wearer. And as I recall I amended the claims so that they  
18 recited two tubes.

19 Q In the remarks accompanying that amendment you state  
20 that "All the claims have been amended to define a headset in  
21 which the transducers are held adjacent to the wearer's ear  
22 and in which two tubes are used, one from the microphone to  
23 the mouth and the other from the receiver to the ear. This  
24 arrangement is not shown by Dreher, who has only one tube,  
25 nor by the other art cited by the Examiner."

26 THE WITNESS: Off the record.

1119



1 (Discussion off the record.)

2 MR. CLARK: Back on the record again.

3 Q (By Mr. Clark) Did you discuss this inclusion of an  
4 ear tube in the claim with anyone at Plantronics?

5 A I believe so, yes.

6 Q With whom?

7 A It may have been Keith Larkin, who at that time may  
8 have left Plantronics. I'm not sure. Or it may have been  
9 with Courtney Graham.

10 Q What was discussed?

11 A I have no recollection.

12 Q Did they understand that all of the claims were so  
13 limited to the use of two tubes?

14 A I have no idea what they understood.

15 Q Did they agree to the amendment?

16 A I don't remember.

17 Q Thereafter, before receiving a reply from the Patent  
18 Office to that amendment, you filed a supplemental amendment  
19 on January 11, 1965. In that supplemental amendment claims  
20 one to nine were cancelled and re-written as claims twelve  
21 to sixteen, and a new claim seventeen was added to cover a  
22 single acoustic tube in combination with a diaphragm of a  
23 mask.

A Yes.

24 Q Why was this supplemental amendment filed?

25 A I have no recollection. I -- this is vague, but I  
26 recall Keith Larkin going back to his oxygen mask embodiment,

1120

1 which he always emphasized because he was a pilot and was  
2 interested in this particular aspect of this device. And I  
3 think, although this is vague, this was added because he was  
4 interested in protecting the oxygen mask.

5 Q Well, leaving aside claim seventeen, why were claims --  
6 the other claims rewritten?

7 A I have no present recollection. I would have to compare  
8 the language and make a guess as to why it was done.

9 Q Do you remember how it came about that you took the  
10 application up for further action on your part at that  
11 particular time? A No, I don't.

12 Q Thereafter you filed another supplemental amendment,  
13 just ten days later, in which you refer to a telephone call  
14 from the Examiner. A I did?

15 Q There it is, the supplemental supplemental amendment.  
16 Did the Examiner call you?

17 A I guess. I have no recollection.

18 Q Did he indicate that the case would be allowed once the  
19 changes in that amendment of January 21 were made?

20 A I have no recollection.

21 Q Was this the only discussion you had with the Examiner  
22 concerning this application while it was pending?

23 A To the extent that I recall, yes, that's correct. He  
24 may have objected to the alternative "or".

25 Q Let's see. Going back to the amendment you made to the  
26 claims in December, '63 to add the second tube, namely, the

1121

1 ear tube, weren't such tubes well known as standard pieces  
2 prior to the time of Larkin's invention?

3 MR. JANICKE: I would like to voir dire the witness  
4 on his background and qualifications in the headset art, if  
5 your question pertains to standard or known by people skilled  
6 in the art.

7 MR. CLARK: Well, let me word that a little  
8 differently.

9 Q (By Mr. Clark) Did you know that such tubes were well  
10 known as standard pieces prior to the time of the Larkin  
11 invention?

12 A Tubes -- my -- the knowledge of the art that I had was  
13 stethoscopes I had seen in doctors' areas but I have no back-  
14 ground in headsets at all.

15 Q I hand you a reprint of an article entitled, "The Use  
16 of Acoustical Tubes to Improve Microphone Performance" by  
17 W. C. Larkin and A. S. Dennis, which has been marked for  
18 identification as Larkin Exhibit Number 10. Have you seen  
19 that article before?

20 A I have no recollection. I recognize the pictures but --  
21 they are the same pictures that are in the file history  
22 folder.

23 Q On page one, paragraph three -- would you let me see  
24 that? There is a statement there that an acoustical tube is  
25 used to convey sound from the corner of the user's mouth to  
26 the microphone. A standard earpiece is used to carry sound

1122



1 from the receiver unit to the ear.

2 Do you recall ever reading that before?

3 A I don't recall, no.

4 Q I understand from what you say that you don't recall  
5 ever being advised that that earpiece was standard, either by  
6 Mr. Larkin or by anyone else?

7 A Well, I don't know what you mean by an earpiece.

8 Q Well, the tube twenty-nine and the piece on the end of  
9 it which fits within the wearer's ear.

10 A I may have seen this but I have no recollection of it;  
11 might have been the standard piece of the hearing aid art.  
12 I don't know.

13 MR. JANICKE: Off the record.

14 (Discussion off the record.)

15 MR. CLARK: Would you state it?

16 MR. JANICKE: Oh, all right. I have offered to  
17 stipulate with Mr. Clark that the receiver tube and the ear  
18 tip were standard items in the hearing aid business at the  
19 time of the Larkin invention and were commercially available  
20 for some time prior to that.

21 Do you so stipulate?

22 MR. CLARK: I do so stipulate.

23 Q (By Mr. Clark) I hand you a reproduction of an  
24 advertisement entitled, "Plane-Aids", p-l-a-n-e hyphen, a-i-  
25 d-s', new sun and fun glasses, carrying the name of Plane-Aids  
26 Company, which I believe was a predecessor in interest of

1123

1 Plantronics. This has been marked for identification as  
2 Larkin Exhibit Number 1. Did you ever see that before?

3 A No, never have. If I had I might have bought one.

4 Q I hand you a copy of a patent to Flygstad, et al, Number  
5 -- what is the number of that?

6 A 3,280,273.

7 MR. CLARK: I ask that that be marked for  
8 identification as Chognard Exhibit Number 3.

9 (Whereupon, the document above-  
10 referred to, being Flygstad, et  
11 al Patent Number 3,280,273, was  
12 marked Chognard Deposition  
Exhibit Number 3 for  
identification.)

13 Q (By Mr. Clark) Did you ever see the Flygstad Patent  
14 before?

A I don't believe so.

15 Q I hand you two reproductions of advertisements by  
16 Telex, which has been marked as Larkin Exhibits Number 7 and  
17 8, and inquire whether you ever saw them before?

18 A I don't believe I have, although the face on them  
19 really looks familiar. No, I don't believe I have ever seen  
20 these, either one.

21 Q I hand you another publication entitled, "Lightweight  
22 Headset and Boom Microphone, ARINC Characteristic Number  
23 535" issued March 25, 1957 and I inquire whether you have ever  
24 seen that before? I call your attention particularly to the  
25 drawing on page eight.

26 A No, I haven't seen that before.

1124

1 Q Were you aware of any other publication showing an  
2 ear tube in a headset prior to the issuance of the Larkin  
3 Patent?

4 A I have a very vague recollection that a search was made  
5 by Allen and Chromy and there were some references of some  
6 art in the file. The one I do recall distinctly is Dreher,  
7 because I thought this was the most pertinent art of the  
8 things I had seen at the time.

9 Q Did Larkin or anyone else at Plantronics ever indicate  
10 to you that they knew of such a publication showing an ear  
11 tube in a headset?

12 A No, not prior to their filing this.

13 Q I note that -- referring to Larkin's Exhibit Number 10,  
14 being the Larkin and Dennis article, page one of the article  
15 states: "The outstanding feature of the unit is its use of  
16 an acoustical tube to transmit sound from the corner of the  
17 user's mouth to the microphone." And paragraph three on  
18 page two states that the central feature of the headset is  
19 the acoustical tube. A That's correct.

20 Q Did Larkin ever tell you that the outstanding and  
21 central feature of his headset was the acoustical voice tube  
22 and that the ear tube was simply a standard piece?

23 A Not that I recall, no. We had some discussions about  
24 the tube because apparently they obtained better results  
25 with some material. It depended. There seemed to be some  
26 magic around it, the way he talked.

11251



1 MR. JANICKE: If I may ask a question at this  
2 point, I would like to know were those discussions after  
3 the filing of the application when you were retained --

4 THE WITNESS: Yes.

5 MR. JANICKE: Or before?

6 THE WITNESS: It was after the filing.

7 MR. JANICKE: Thank you.

8 THE WITNESS: And this is one of the reasons I  
9 hired this expert, to see whether he could put his hands on  
10 some phenomenon.

11 MR. CLARK: Off the record.

12 (Discussion off the record.)

13 Q (By Mr. Clark) Turning to the cited Dreher, et al  
14 Patent Number 2,904,640, doesn't the patent actually have  
15 two tubes, one the acoustic voice tube twenty-one and the  
16 other the tube eleven going into the ear?

17 A Well, the aperture eleven is called a canal extension.  
18 From the point of view of sound waves it certainly is an  
19 aperture through which the sound waves travel, but from the  
20 point of view of the comfort of the wearer, which is the  
21 thing Keith was always going back to -- from the outside it  
22 doesn't look like a tube. It's a fat, plug-like body.

23 Q Column two, line fifty-four of the Dreher, et al Patent  
24 refers to that part at "pipe-like extension." Isn't that  
25 the same as a tube?

26 A Where do you see the "pipe-like extension"?

1126

1 Q On page four -- column two, excuse me.

2 A Column two?

3 Q Line fifty-four.

4 A Well, this is the pipe-like extension that is part of  
5 the body here.

6 Q That's right. Isn't a pipe-like extension the same  
7 thing as a tube?

8 MR. JANICKE: To a person skilled in the art, is  
9 that question addressed, or is it addressed to Mr. Chognard?

10 MR. CLARK: It's addressed to Mr. Chognard.

11 MR. JANICKE: All right.

12 THE WITNESS: The extension that is pipe-like looks  
13 a little bit like a tube, yes. The difference between  
14 Dreher and Larkin that struck me at the time was that in  
15 Dreher you have to have something that fits into the ear and  
16 is designed to fit snugly and, therefore, is probably a  
17 custom made piece of equipment, whereas in the Larkin device  
18 it is just a piece of spaghetti.

19 Q What language is there in the claim of Larkin which  
20 distinguishes it from the Dreher, et al Patent?

21 A The emphasis is on the second acoustical tube. The  
22 hearing aid transducer sixteen -- Dreher is what? I can't  
23 remember.

24 MR. JANICKE: I believe he has only a single trans-  
25 ducer which he identifies as this button-type member, Figure  
26 2 of Dreher.

1127

1 THE WITNESS: Yes, whereas in Larkin there are  
2 two transducers, one in the microphone and one in the  
3 receiver and with a tube going to each of the transducers.

4 (Discussion off the record.)

5 MR. CLARK: I have a letter dated March 2, 1967  
6 from Mr. C. P. Graham, President of Pacific Plantronics, Inc.  
7 to Mr. Schiavoni, spelled S-c-h-i-a-v-o-n-i, who is with  
8 AT&T in New York City, and I would ask that you mark it for  
9 identification as Chognard Exhibit 4.

10 (Whereupon, the document above-  
11 referred to, being a three-page  
12 letter dated March 2, 1967, was  
13 marked Chognard Deposition  
Exhibit Number 4 for  
identification.)

14 MR. JANICKE: Let's go off the record.

15 (Discussion off the record.)

16 MR. CLARK: Mr. Janicke and I have agreed to stipu-  
17 late that this exhibit is to be used only to the extent that  
18 is necessary in this particular litigation. This exhibit is  
19 a little bit peculiar in that page three is dated February  
20 28th, 1967, whereas the other two pages are dated March 2nd  
21 but --

22 THE WITNESS: Standard office procedure.

23 Q (By Mr. Clark) Have you ever seen that letter before?

24 A I don't believe so.

25 MR. CLARK: I note that page three of the letter  
26 refers to a Bell system or Bell Telephone Laboratory Model

1128



1 D headset which later became known as Model 61 or 61A and  
2 indicates that it is essentially the same concept as in  
3 1962 Plantronics headset Model MS 51.

4 I have here a four-page brochure issued by Roanwell  
5 Corporation entitled, "Miniature Operators Headsets" and I  
6 ask that you mark it for identification as Chognard Exhibit 5.

7 (Whereupon, the document above-  
8 referred to, being a brochure  
9 entitled "Miniature Operators  
10 Headsets" was marked Chognard  
11 Deposition Exhibit Number 5 for  
12 identification.)

13 MR. CLARK: I have here another advertisement of  
14 Roanwell Corporation entitled, "The New Lightweight R-61A  
15 Telephone Operators Headset" and I ask that you mark it for  
16 identification as Chognard Exhibit Number 6.

17 (Whereupon, the document above-  
18 referred to, being a single-page  
19 document entitled "The New  
20 Lightweight R-61A Telephone  
21 Operators Headset" was marked  
22 Chognard Deposition Exhibit Number  
23 6 for identification.)

24 Q (By Mr. Clark) I hand you a document of several pages  
25 entitled, "The Evolution of the KS 19796 Headset" which has  
26 been marked for identification as Larkin Exhibit Number 19,  
and I call your attention particularly to pages nine and ten  
and the two following photographs, three following photo-  
graphs, excuse me, which these two pages describe and the  
three photographs show the MS 51 molded earpiece self-  
supporting headset. Both the Roanwell 61 headset and the

1129

1 Plantronics MS 51 are headsets involving the use of a plug  
2 which fits within the ear of the wearer, are they not?

3 A The R 61 is and the MS 51 --

4 Q Those photographs are rather poor. You may have to go  
5 by the description.

6 A Both of them are molded earpieces, yes.

7 Q Returning to page three of Mr. Graham's letter to Mr.  
8 Schiavoni, note the two-line paragraph which begins with an  
9 asterisk and says, "Substantially the same concept as evalu-  
10 ated by PPI in 1962, see attachment IV, MS 51 ear mold  
11 constitutes tube to ear connection."

12 If that statement of Mr. Graham is true, then both the  
13 R61 and the MS 51 have a voice tube and an ear tube, do they  
14 not?

15 A It depends on what he means by the word "constitutes"  
16 here. Acoustically that is probably correct.

17 Q Isn't the same true of the headset in the Dreher Patent?

18 A Yes.

19 Q I note further that on page three of his letter Mr.  
20 Graham states that: "We are of the opinion, based upon  
21 extensive discussion with our patent counsel, that the  
22 features of the Model D headset fall under the inventive con-  
23 cepts of Larkin Patent 3,184,556." If this is the case, the  
24 Model D headset must have a voice tube and an ear tube, isn't  
25 that correct?

26 A Off the record. Does this patent include the 556?

1130

1 Q .es. Somewhere floating around here.

2 A And what is the Model D headset?

3 Q Apparently it was a designation used by Bell Labs for  
4 the early models of what eventually became known as the R-61  
5 and they had another prefix for it, BTL-61 or WE-61, I be-  
6 lieve they called it, WE meaning Western Electric.

7 A I don't know. The letter speaks for itself, for what  
8 it is worth. I wasn't the patent counsel with whom they  
9 had this particular discussion, as I recall.

10 Q That was going to be my next question. You anticipated  
11 it.

12 MR. JANICKE: Or mine.

13 THE WITNESS: To get the chronology right, I  
14 prosecuted the patent we are talking about and there was  
15 some further work to be done and I handed the files and  
16 the problems to Al Smith, so from that time on he did some  
17 work for Plantronics and I did not.

18 Q (By Mr. Clark) Do you know who was the patent counsel  
19 he referred to in that letter?

20 A I have no idea. I think that we consulted with people  
21 in New York and people in San Francisco and -- I don't know.

22 MR. CLARK: I have here a letter dated February  
23 20, 1967 and eight pages from Mr. Graham to Mr. Davies,  
24 D-a-v-i-e-s, who is otherwise unidentified in this letter,  
25 and I ask that this be marked for identification as Chognard  
26 Exhibit Number 7.

1131



(Whereupon, the document above-referred to, being a letter dated February 20, 1967, consisting of eight pages, was marked Chognard Deposition Exhibit Number 7 for identification.)

MR. CLARK: Mr. Janicke and I have stipulated that Exhibit 7 is to be used only for the purposes of the present litigation.

Q (By Mr. Clark) I call your attention to page four -- excuse me, page five, Section IV, subparagraph number one -- no, excuse me, subparagraph number two which states as one possible future alternative: "or, the refinant and production of the MS 51/T-56, see attachment III with accompanying photographs 1-D and 1-E, (ear mold mounted unit with idle gain reduction amplifier), covered by Patent 3,184,556." Age on page seven, Section VII, the paragraph which I just read from, Section IV is repeated as a paragraph numbered 2. Would it appear from that letter that those paragraphs require that the ear molded headset in question have a voice tube and an ear tube?

A I should think so, unless it is covered by claim six.

Q Claim --

A I have no knowledge of any of this. I can't remember when I discontinued working for Plantronics but it was fairly close after the allowance of the 3,184,556 Patent, so it must have been sometime in 1965, and I have no knowledge of anything that happened in 1967.

1132

1 Q Did you ever discuss with Mr. Larkin or anyone else  
2 at Plantronics the question of filing foreign applications  
3 corresponding to Larkin Patent Number 3,184,556?

4 A Yes.

5 Q Do you recall when that was first discussed?

6 A It might have been after I appeared on the scene, so  
7 sometime in 1963.

8 Q Do you recall what countries were discussed?

9 A Yes. I believe Canada was discussed.

10 Q Any other countries?

11 A He was having some negotiations at the time with some-  
12 body in England and I think he may have, or something may  
13 have been filed in England. I don't know.

14 Q Do you recall why it was discussed?

15 A No, not particularly.

16 Q Did you at that time advise Plantronics that one must  
17 file within one year, one must file abroad within one year  
18 of the U. S. filing date in order to have the benefit of the  
19 U. S. filing date under existing international convention?

20 MR. JANICKE: I am going to object to the question  
21 as calling for the legal advice that may have been rendered  
22 by the attorney to the client, although I certainly agree it  
23 is true that if you want the convention priority you must  
24 file within a year.

25 MR. CLARK: I may repeat that question again a  
26 little later. For the moment I will pass it, in view of

11331

1 your objection.

2 MR. JANICKE: Well, is there a dispute as to  
3 whether that is privileged, his advice to the client?

4 MR. CLARK: If it concerns an attempt, what I  
5 might term a conspiracy for lack of any better term, to  
6 secure a patent in a foreign country, which patent was known  
7 by either the attorney or Plantronics to be invalid, then  
8 that destroys the privilege.

9 MR. JANICKE: I agree and I have no objection to  
10 preliminary questions on whether that is the case, and if  
11 that appears to be the case by this witness' testimony I will  
12 have no objection to even his saying what his advice was, but  
13 I think you first must show those foundation facts, and  
14 attempt to knowingly obtain an invalid patent in a foreign  
15 country.

16 Q (By Mr. Clark) Did you yourself investigate to see  
17 whether any statutory bar existed which would prevent the  
18 filing of valid patent applications in foreign countries?

19 A Off the record. I'm giving you a chance to object, but  
20 do I answer?

21 MR. JANICKE: I have no objection.

22 THE WITNESS: No objection? Yes.

23 Q (By Mr. Clark) Did you find any such statutory bar?

24 A As I recall, yes.

25 Q I hand you a copy of British Patent Number 1,009,818,  
26 which has been marked for identification as Larkin Exhibit

1134



1 Number 22, and inquire whether it corresponds to the U. S.  
2 Larkin Patent Number 3,184,556?

3 MR. JANICKE: I will stipulate that it does.

4 Q (By Mr. Clark) I note that it was filed in Great  
5 Britain on August 25, 1964.. When you found the existence  
6 of the statutory bars that you just mentioned, were the  
7 statutory bars in effect as of August 25, 1964?

8 MR. JANICKE: In England?

9 MR. CLARK: In England?

10 MR. JANICKE: I have no objection, if he knows.

11 THE WITNESS: That I don't remember. I can tell  
12 you what I do remember but that I don't remember.

13 Q (By Mr. Clark) What do you remember about filing?

14 A I didn't file any. I did not. Keith Larkin -- you know  
15 this is ten years later.

16 MR. CLARK: Yes.

17 THE WITNESS: It is to the best of my recollection.  
18 Keith Larkin negotiated with some distributor or representa-  
19 tive in England. I think Keith went to England at the time.  
20 And I believe that distributor or representative thought it  
21 was advisable to file a patent application.

22 Q (By Mr. Clark) Did you handle any correspondence, that  
23 is, did you transmit a copy of the U. S. application?

24 A Not that I recall. I'm pretty sure I didn't, but the  
25 passage of time --

26 Q Did you ask Mr. Larkin or anyone else at Plantronics as

1135

1 to whether there had been any sales in England?

2 A I don't remember. The subject matter or something  
3 similar to that was discussed at one time but I don't  
4 remember asking specifically that question, whether there had  
5 been any sales in England.

6 Q Did you inquire as to what publications having inter-  
7 national distribution there may have been made concerning the  
8 headsets?

A Yes.

9 Q Did you find any such publications?

10 A I believe I did, yes.

11 Q Can you identify the publications?

12 A I believe they were magazine advertisements. No, I  
13 could not identify the publication.

14 Q Did you ask whether any Plantronics brochures or sales  
15 literature had been sent to England?

16 A Probably. I don't recall specifically that question,  
17 but probably.

18 Q Did you check to see whether there had been any public  
19 uses in England by United Air Line pilots or other pilots who  
20 fly there?

21 A No, I did not. I didn't handle the filing in England.  
22 I recall giving him some advice on the subject but I did not  
23 make a -- I didn't handle the filing.

24 MR. CLARK: I have here a copy of French Patent  
25 Number 1,397,803, issued to Airmed, A-i-r-m-e-d, Limited,  
26 and I ask that it be marked for identification as Chognard

1136

1 Exhibit Number 8.

2 (Whereupon, the document above-  
3 referred to, being a four-page  
4 document entitled "Brevet  
5 D'invention, was marked Chognard  
6 Deposition Exhibit Number 8 for  
7 Identification.)

8 MR. CLARK: I have here a letter dated December 3,  
9 1965 addressed to Mr. J. C. Chognard from S. G. Spragens,  
10 Director of Marketing, and I ask that it be marked for  
11 identification as Chognard Exhibit 9.

12 (Whereupon, the document above-  
13 referred to, being a single-page  
14 letter dated December 3, 1965,  
15 was marked Chognard Deposition  
16 Exhibit Number 9 for  
17 identification.)

18 Q (By Mr. Clark) That letter mentions a French patent  
19 which is not identified in the letter by number but I ask you  
20 whether the French patent referred to is, in fact, the Airmed  
21 Patent Number 1,397,803?

22 A I have no recollection of it.

23 Q Of the letter?

24 A Of the letter or of the patent. It is very hard to read.

25 Q I can read it. I have spent sufficient time over it so  
26 that I can. If you would like me to read it to you, I will.

27 A Looks like a potential infringement problem on the part  
28 of Plantronics, or am I wrong?

29 Q Do you want me to read the whole or particular parts of  
30 it or -- maybe I should read the whole letter, because the

1137



1 copy is so poor.

2 "Dear Mr. Chognard: As per our recent telephone con-  
3 versation, I am enclosing the following information for your  
4 perusal relative to the Airmed Limited Patent that was filed  
5 in France -- June 5, 1964:

6 "1. Mr. S. C. Bentley's letter 12 November, 1965  
7 suggesting that Dr. Brent of Stevens, Langner, Parry and  
8 Rollinson be allowed to represent us.

9 "2. One copy of the French Patent.

10 "3. One copy of our Patent.

11 "4. Two additional patents filed on 'acoustic-type'  
12 devices, which may be of interest.

13 "5. Copies of early clippings describing our product.

14 "6. Early photos of our product. Note: Please retain  
15 the photos and return them to me when you are finished with  
16 them, as I wish to return them to our historical file for  
17 future reference.

18 "I am sending Mr. S. C. Bentley a copy of this letter,  
19 and advising him that he will hear from us, since you have  
20 had an opportunity to review the situation and advise  
21 Plantronics as to future action. Because of the sensitive  
22 nature of the situation, I trust that you will expedite what-  
23 ever suggestions you may have. Thank you for your attention  
24 to this matter."

25 MR. JANICKE: I would like to ask preliminarily,  
26 Mr. Chognard, you are fluent in reading French, are you not?

1138

1 THE WITNESS: Yes. I don't recall the circum-  
2 stances. I don't even recall seeing this patent before.  
3 Now, it may have been sent to me because I read French and I  
4 may have turned it over to Al Smith at the time. It is very  
5 difficult to determine whether a French patent is an in-  
6 fringement or not, because claims don't mean anything. I  
7 just don't recall.

8 Q (By Mr. Clark) The French Patent states that it is  
9 based on a British application filed June 7, 1973. It appears  
10 to me that the question involved is rather whether the  
11 Plantronics British Patent Number 1,009,818, which was filed  
12 August 12th, 1964, might possibly be invalidated by the  
13 earlier British application filed June 7, 1963 for Airmed.

14 A That could be. I have no recollection. I don't  
15 remember making any kind of a study. I could check whether  
16 I had ever sent a bill in 1965 to Plantronics, but I really  
17 doubt it. December, '65. I could check my records very  
18 easily. I don't think I was doing any work for them at the  
19 time.

20 Q I believe you stated that you were aware of Mr. Bowman's  
21 suit against Plantronics? A Yes.

22 Q Were you ever contacted in relation to that suit?

23 A Yes.

24 Q By whom?

25 A I should say I have been -- I was contacted in relation  
26 to, not the suit, but perhaps the controversy before it

1139

1 became a lawsuit. I don't remember what dates were involved.  
2 I discussed this with Keith Larkin. Keith had written some  
3 sort of a letter to Bowman, who had done some work, machining  
4 something or putting -- helping, making the first model of  
5 this device or a similar device, and the one thing I remember  
6 distinctly is that Keith had committed to pay Bowman some  
7 money and had made an amendment to some paragraph in his own  
8 handwriting, which made it an unending commitment, for which  
9 I thoroughly chewed him out. And I probably discussed with  
10 Larkin ways of conceivably settling this thing. But it may  
11 have been before he was -- I don't -- the dates are very  
12 vague in my mind. He was living in Santa Cruz, was he not?  
13 The suit was filed in Santa Cruz, wasn't it?

14 MR. JANICKE: It was eventually moved to Santa  
15 Cruz County for trial. It was Bowman versus Plantronics.

16 Q (By Mr. Clark) In Bowman's deposition -- excuse me, in  
17 Mr. Larkin's deposition before trial in the Bowman litigation  
18 he was asked, beginning on page seventeen, line twenty-two:

19 "Is the acoustical speaking tube, insofar as it is in use in  
20 connection with the MS-50 one of the matters on which you  
21 have been allowed a patent?" His answer, beginning on line  
22 twenty-five: "No." Now, there we are getting into a  
23 technical area when we get to the Item B here, referring to  
24 the patent searches. The acoustical tube is in the public  
25 domain and has been since seventeen years after 1878, a tube  
26 to conduct the voice to a microphone. The acoustical tube

1140



1 headset had been in general use for some time before  
2 Plantronics ever was formed. Our patent relates to the cap-  
3 sule-type headset to begin with. The capsule headset can be  
4 snapped into a pair of eyeglass frames. Did you want me to  
5 go through the entire thing?"

6 Did Mr. Larkin ever mention that 1878 date to you?

7 A Never.

8 Q I hand you a copy of British Patent Number 191 of 1878,  
9 which has been marked as Larkin Exhibit 18, and ask if you  
10 ever saw it?

11 A No, and I probably would have read it. No, I never saw  
12 this.

13 MR. JANICKE: This question of the British patent  
14 has come up in several depositions this week and I have said  
15 nothing about it till now, but I think I ought to make a  
16 statement on the record concerning it and concerning Mr.  
17 Larkin's testimony. Now, this patent was sent by you, Mr.  
18 Clark, to Plantronics before his testimony, before Mr. Larkin's  
19 testimony in the case and, therefore, that would seem to be  
20 a likely place where he might have learned about it. It was  
21 brought to the attention of Plantronics by you before he  
22 testified.

23 MR. CLARK: That's right.

24 MR. JANICKE: All right.

25 Q (By Mr. Clark) For what period of time did you repre-  
26 sent Plantronics?

1141

1 A The only matter where I represented Plantronics was the  
2 prosecution of Larkin Patent 3,184,556. I was friendly with  
3 Harold Buttner. Harold Buttner is one of the Directors and  
4 he is also -- perhaps was at the time, but he is also a  
5 Director of the Value Line Development Fund. I believe Value  
6 Line put some money in Plantronics. I knew socially Frank  
7 Smith, and we were coinvestors in some venture capital deals,  
8 I was, with Frank Smith. And once in a while perhaps I would  
9 be asked a question, perhaps by Buttner or Buttner would ask  
10 somebody of Plantronics to call me and ask me something, but  
11 the only time I really represented them in any matter at all  
12 was in connection with this patent.

13 Q Did you have any responsibility for reviewing or  
14 approving Plantronics publications?

15 A No, never.

16 MR. CLARK: That's all.

17 MR. JANICKE: I have no questions.  
18  
19

20  
21 Subscribed and sworn to before me this  
22 \_\_\_\_\_ day of \_\_\_\_\_, 1973.

23  
24 \_\_\_\_\_  
25 Notary Public in and for the County of  
26 \_\_\_\_\_, State of California.

1142

STATE OF CALIFORNIA        )  
COUNTY OF SANTA CLARA    ) ss.

I do hereby certify that before the taking of the foregoing deposition, the above named deponent was duly sworn by me according to law to testify the truth, the whole truth and nothing but the truth in the above-entitled matter; that the foregoing is a full, true and correct transcript of the proceeding had at the taking of said deposition.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal.

Date: \_\_\_\_\_ VICTOR C. OSTERMAN

The signing of the deposition by the deponent was waived by stipulation at the time of \_\_\_\_\_ the taking of the deposition.

The deponent personally appeared before me on the \_\_\_\_ day of \_\_\_\_\_, 19\_\_, and was given an opportunity to read the deposition. Thereafter, and upon the same date, the deposition was signed by the deponent.

Upon completion of the transcript of the deposition, the deponent was notified that it was ready for signature, but the deposition was not signed by the deponent for the following reason: \_\_\_\_\_

1143



Chognard Depos.  
Exhibit No.

Page in Depos.

LISTING OF DEPOSITION EXHIBITS  
JEAN C. CHOIGNARD

- |    |         |  |
|----|---------|--|
| 1. | (p. 8)  | Dreher et al U.S. patent<br>2,904,640  |
| 2. | (p. 8)  | Rackham et al U.S. patent<br>2,717,932   |
| 3. | (p. 19) | Flygstad et al U.S. patent<br>3,280,273  |
| 4. | (p. 23) | Letter dated March 2, 1967,<br>from C.P. Graham to Schiavoni<br>of AT&T, re "Lightweight Head-<br>set Considerations" Bell<br>System Operators" (EP 0860-58) |
| 5. | (p. 24) | Roanwell sales brochure entitled<br>"Miniature Operators Headsets"   |
| 6. | (p. 24) | Roanwell sales flyer entitled<br>"The New Lightweight R-61A Tele-<br>phone Operators' Headset"   |
| 7. | (p. 27) | Letter dated February 20, 1967,<br>from Graham to Davies (EP 0850-<br>43)  |
| 8. | (p. 32) | Airmed, Ltd. French patent<br>1,397,803  |
| 9. | (p. 32) | Letter dated Dec. 3, 1965, from<br>S.G. Spragens to J.C. Chognard<br>(EP 7551)   |

1144

Sept. 15, 1959

J. J. DREHER ET AL

2,904,640

COMBINATION EAR-MOUNTED MICROPHONE AND RECEIVER INSTRUMENT

Filed July 30, 1957

FIG. 3

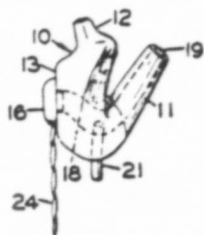


FIG. 2

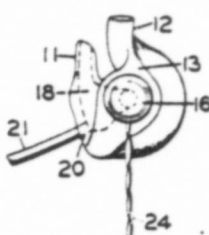


FIG. 4

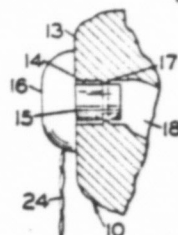


FIG. 1

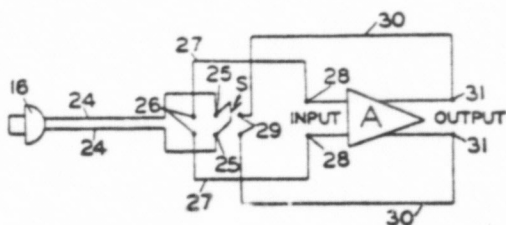
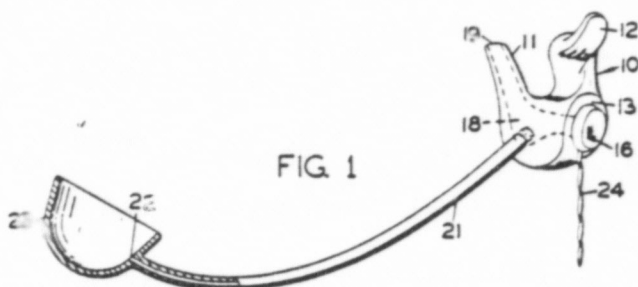


FIG. 6

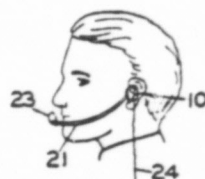


FIG. 5

INVENTORS

JOHN J. DREHER  
LEWIS J. SCHWARTZKOPF

BY

*W. J. Rando*

ATTORNEY

SHOGNARD DEPO. EX 4  
11/5/73  
200  
1145

March 2, 1957

1

2,904,640

COMBINATION EAR-MOUNTED MICROPHONE  
AND RECEIVER INSTRUMENT

John J. Dreher, Worthington, and Lewis J. Schwartzkopf,  
Columbus, Ohio, assignors to The Ohio State University  
Research Foundation, Columbus, Ohio, a corporation  
of Ohio

Application July 30, 1957, Serial No. 675,078

4 Claims. (Cl. 179—156)

The present invention relates to audible signal transmitting and receiving apparatus and more particularly to a combined microphone and speaker device for use by aircraft personnel, radio operators, telephone operators or other persons using communication systems.

In the past, pilots, radio operators and other aircraft and ground personnel, have commonly used separate earphone-type receiver or speaker devices and lip, throat, or hand-held microphones to respectively receive and transmit voice signals. In some instances, the earphones and microphone are built into, or mounted in aviators' helmets or oxygen masks, or may be simply worn over the head and held in the hand where desirable. With the advent of high altitude flight, the hand-held microphone has been substantially replaced by the throat-type microphone or by a lip-type microphone built into the usual oxygen mask. However, considerable difficulty is still encountered with the so-called built-in types of earphones and microphones and the same are relatively costly and in some cases uncomfortable and unsanitary from the standpoint of the wearer.

Also, it has heretofore been proposed to employ the usual type of electromagnetic-vibrating diaphragm-type of earphone or receiver device as both a receiver and as a microphone, but due to the relatively high noise level encountered in aircraft operation, previous attempts along this line have proved unsuccessful in attaining a desired signal-to-noise ratio necessary to transmit a clear, ungarbled and intelligible signal.

Accordingly, the primary object of the present invention is to provide a structurally simple lightweight combination microphone and speaker device adapted to be mounted in and upon the human ear and operable selectively either as a microphone or speaker in transmitting voice signals to and from the ear of a wearer.

Another object of this invention is to provide a combined ear-mounted microphone-speaker which is characterized by its ability to transmit comparatively clear, ungarbled and intelligible voice signals and which attains, when operating as a microphone, a desirably high signal-to-noise ratio without resort to the use of cumbersome and uncomfortable ear pads or other noise-shielding equipment.

It is a further object of the present invention to provide a device of this character which may be constructed from comparatively inexpensive, lightweight and readily available component parts, and one which may be easily fitted to and supported by the human ear and worn and operated in greater comfort than has heretofore been possible with the use of conventional types of earphones, headsets and microphones.

For a further and more complete understanding of the present invention and the various additional objects and advantages thereof, reference is made to the following description and the accompanying drawing, wherein:

Fig. 1 is a perspective view, partially in vertical section, of a preferred form of microphone-speaker device formed in accordance with the present invention;

2

Fig. 2 is a side elevational view of the ear plug or body portion of the present microphone-speaker device looking toward the outer side thereof;

Fig. 3 is an end elevational view of the ear plug body;

Fig. 4 is an enlarged fragmentary vertical sectional view taken through the ear plug body and illustrating the relative location of the sound-to-electrical impulse transducer;

Fig. 5 is a small scale perspective view illustrating the present microphone-speaker device as worn in the human ear;

Fig. 6 is a diagram of the electrical circuit of the sound-to-electrical impulse transducer and associated amplifier and switching mechanism.

The present invention proceeds on the principle of using a single, standard type of sound-to-electrical impulse transducer, both in the capacity of a microphone and as a receiver or speaker device. Furthermore, the present invention contemplates the use of such a transducer in combination with a molded plug-like body adapted to be snugly fitted directly to the outer regions of the human ear and formed so as to transmit audible signals both to and from the ear canal. Recent experiments have shown that voice signals may be transmitted with efficiency through the human ear canal and/or through the bone or tissue structure of the skull and ear. However, in surroundings of relatively high ambient noise and/or vibrations, such as in aircraft operation, it has been found that ambient noises and vibrations may also be transmitted through the skull and ear, thus making it difficult to attain a desired high signal-to-noise ratio which is necessary to transmit a clear and intelligible voice signal.

We have found that it is possible to obtain a desired signal-to-noise ratio in aircraft operations by utilizing an acoustic coupling of mouth and ear-emitted signals, such combined signals being conducted to the sound-to-electrical impulse transducer through suitable merging passages where such combined signals are translated into electrical impulses, amplified, and broadcast through conventional radio apparatus.

Referring now more particularly to the drawing, wherein is illustrated a single preferred form of the present invention, the numeral 10 designates generally a plug-like body which is preferably molded or otherwise formed from a suitable synthetic resin, and shaped to snugly and directly fit into the exterior regions of the human ear. The ear plug body 10 may, if desired, be custom molded to fit the ear of the individual wearer, or may, where desirable, be formed in generally standardized sizes and shapes after the manner of the usual ear plug or mold employed in connection with the ordinary hearing aid device. In the usual manner, the ear plug body includes a laterally projecting pipe-like extension 11 adapted to extend a distance within the ear canal and a convoluted upper and forward retaining finger 12 which is adapted to fit beneath the outer tissue flap of the human ear to hold the plug or mold body 10 in substantially snug, flush-fitting relation to the exterior portions of the ear. The body 10 further includes a flat outer side portion 13 which is formed with a cylindrical socket 14 to frictionally and removably receive the tubular stem portion 15 of the usual button-like hearing aid transducer 16. In order to frictionally retain the transducer 16 within the socket 14 of the ear plug body 10, the latter is formed with an annular radially inwardly extending rib 17 which resiliently and frictionally engages the tubular stem portion 15 of the transducer 16 to hold the latter within the socket 14 against accidental withdrawal.

Communicating with the transducer-receiving socket 14 is an internal passage 18 which extends transversely through the body 10 and terminates in an opening 19 at

1146



the end of the canal extension 11 of the body. The body 10 is also formed at its forward end with a relatively small diametere socket 20 communicating with the passage 18, and in which is press-fitted the inner end of a relatively small diametere hollow tube 21. The tube 21, as shown in Fig. 5, is arranged to extend forwardly and laterally inwardly of the plug body 10 so as to partially encircle one side of the face of the wearer, and terminates substantially closely adjacent the lips of the wearer in an opening 22. Advantageously, the outer open end 22 of the tube 21 may be provided with a relatively small hemispherical cup-like body 23 which opens toward the mouth of the wearer so as to effectively focus voice signals emitted from the mouth and channel the same backwardly through the tube 21. If desired, particularly when the present device is used in aircraft operations, the open end of the cup-like body 23 may be closed by a protective film of polyethylene resin or the like so as to minimize undesired wind or other ambient noises.

Thus, it will be seen that when the present microphone-speaker device is used in the capacity of a microphone, voice signals, or sounds are conducted both through the tube 21 from the lips of the wearer and also through the ear canal to the internal passage 18 of the plug-like body 10 where the ear and mouth transmitted signals or sounds are combined and impressed upon the sound-sensitive element of the transducer 16. It is also thought that at least a part of the voice signals emitted by the wearer may be conducted through the bone structure of the skull and thence possibly through the tissue of the ear to the plug-like body 10, and thence to the sound-responsive element of the transducer. It has been found through experimentation that the signal-to-noise ratio encountered in ordinary aircraft operations is such that ear-transmitted signals alone, without a coupled mouth-transmitted signal results, in some cases, in a garbled unintelligible transmission. This is believed due to the transmission of external noises and vibrations through the body of the wearer and to the plug-like body 10 and thence to the transducer. However, by combining both mouth and ear transmitted signals, the signal-to-noise ratio is increased to a degree where the resultant broadcast is entirely clear, ungarbled and intelligible.

Fig. 6 of the drawing illustrates diagrammatically the operating circuit for the present combination microphone-speaker device. The sound-to-electrical impulse transducer 16 is provided in the usual manner with a pair of lead wires 24 which extend remotely from the button-like transducer and which are electrically connected respectively with the center poles or terminals 25 of a double pole, double throw switch S. It will be understood that the switch S may take any suitable standard form and may be located in a convenient, readily accessible position to be operated by the hand, or foot. The switch may, if desired, be spring pressed to a position to electrically connect the transducer 16 to the output side of the associated amplifier A, in order that the wearer may normally listen to or receive incoming signals, and may be manually switched to an opposite position connecting the transducer 16 to the input side of the associated amplifier A, in order that signals may be broadcast or transmitted by the wearer. Toward this end, the switch S includes a first set of secondary terminals 26 which are connected by the leads 27 to the input terminals 28 of the amplifier A. The switch S further includes a second set of terminals 29 which are electrically connected by the leads 30 to the output terminals 31 of the amplifier A. It will here be understood that the circuit diagram of Fig. 6 does not include in its showing the usual radio receiver and transmitter components, other than the common amplifier A which may be selectively connected either to an associated receiver or transmitter circuit in a manner well known in the art.

Thus, in the operation of the present microphone-speaker device, the switch S may be moved selectively to a position connecting the transducer 16 with the output

of the amplifier A by way of the switch terminals 29 and leads 30 in order that the wearer may listen to incoming radio signals or broadcasts. Merely by manipulating the switch S to connect the transducer 16 to the switch terminals 26, the transducer is connected to the input side of the amplifier A in order that voice signals may be broadcast through the device.

In view of the foregoing, it will be seen that the present ear-mounted combination microphone-speaker or ear-phone device may be constructed of more or less standard, readily available and lightweight component parts, and may be connected through the use of a suitable double pole, double throw switch mechanism with the amplifier of a standard radio receiver-transmitter apparatus so as to function selectively both as an earphone receiver or speaker device and as a microphone.

The present combined ear-mounted microphone-speaker is characterized by its economy of manufacture, its comfort to the wearer and its operational efficiency and capability of attaining a sufficiently high signal-to-noise ratio, when operated as a microphone, to transmit clear ungarbled and intelligible signals even in surroundings of relatively high ambient noise. Further, due to the relatively small size and compactness of the present microphone-speaker, the same may be used conveniently by aircraft personnel and worn within the usual aircraft crash helmets or the like without in any way interfering with or obstructing the wearer.

While we have disclosed what we look upon to be a presently preferred form and construction of our improved combination microphone-speaker, it will be understood that the same is susceptible to modification in regard to details of construction and design without departing from the spirit of the invention or the scope of the following claims.

We claim:

1. A combination ear-mounted microphone and receiver comprising an ear plug body arranged to directly and snugly fit within the outer portions of a human ear and formed with a relatively elongated extension arranged to extend within the ear canal and an internal passage extending through said extension and terminating in a socket adjacent an outer surface of said body; a sound-to-electrical impulse transducer carried in said socket and communicating with the internal passage thereof; and an elongated tubular member having one end connected with said body and communicating with the internal passage formed therein, said tubular member extending outwardly from said body and terminating in an open outer end portion disposed closely adjacent the lips of a person in whose ear said body is fitted, the passage of said body and said tube serving to conduct sound waves emitted both from the lips and ear of a wearer to said transducer.

2. A combination ear-mounted microphone and receiver as defined by claim 1, including a relatively enlarged cup-shaped device carried on the open outer end of said tubular member.

3. A combined microphone and speaker device comprising an ear plug-type body formed with an open-ended passage extending therethrough and arranged to snugly fit within and be supported by the exterior regions of the human ear; a single sound-to-electrical impulse transducer carried in said body in communication with one end of said passage; and a relatively small diametere, open-ended, hollow tube carried at one end thereof by said body and communicating with the passage of said body intermediate the ends of said passage and having an opposite end portion extending remotely outwardly from said body and arranged to terminate adjacent the lips of a person in whose ear said body is positioned, said tube serving to conduct mouth-emitted sounds from the lips of a person wearing said device to the passage of said body and thence to said transducer.

4. A combined microphone and speaker device comprising a body of a shape and size to at least partially and

1147

snugly fit into a human ear and having a passage therein arranged to communicate directly at one end thereof with the canal of an ear into which said body is fitted; a single sound-to-electrical impulse transducer carried by said body and communicating with the opposite end of said passage; and a relatively small diametered, hollow tube carried at one end by said body and arranged to extend outwardly from said body to a position closely adjacent the lips of a person in whose ear said body is positioned, said tube being open at both ends thereof and having one end communicating with the passage of said body intermediate the ends thereof, whereby sounds emitted from the lips of such person may be conducted

through said tube to the passage of said body and thence to said transducer.

## References Cited in the file of this patent

## UNITED STATES PATENTS

2,098,402	Reifsteck	Nov. 9, 1937
2,353,070	Pitkin	July 4, 1944
2,485,405	Olney	Oct. 18, 1949
2,535,063	Halstead	Dec. 26, 1950

## FOREIGN PATENTS

731,830	Great Britain	June 15, 1955
---------	---------------	---------------

1148

Sept. 13, 1955

R. H. RACKHAM ET AL  
MICROPHONES

2,717,932

Filed Aug. 8, 1951

2 Sheets-Sheet 1

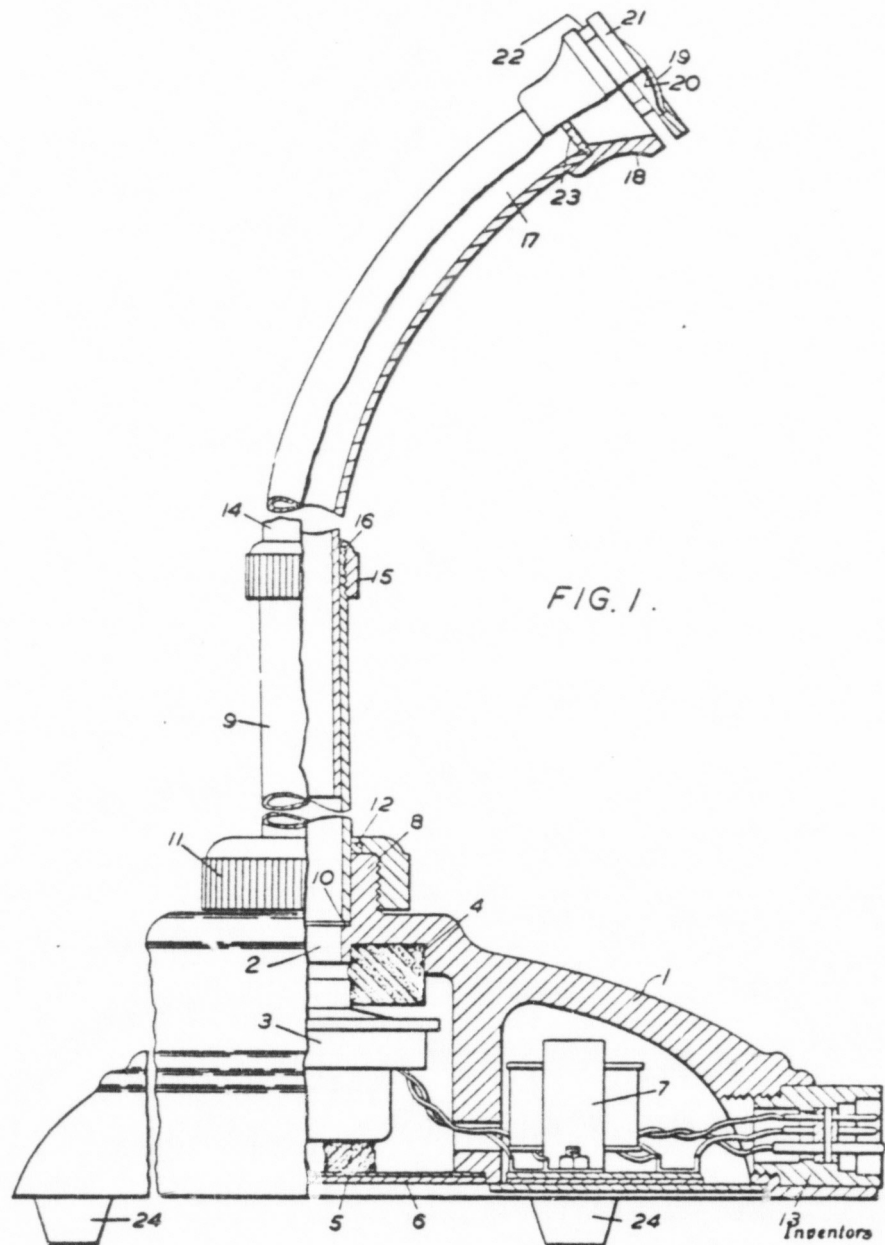


FIG. 1.

RONALD HASTINGS RACKHAM,  
& TERENCE BRIAN LIVINGSTONE,

By  
*Stone, Boyden & Zisch*  
Attorneys.

CHICAGO DEPT # 2  
11/8/73

1149



Sept. 13, 1955

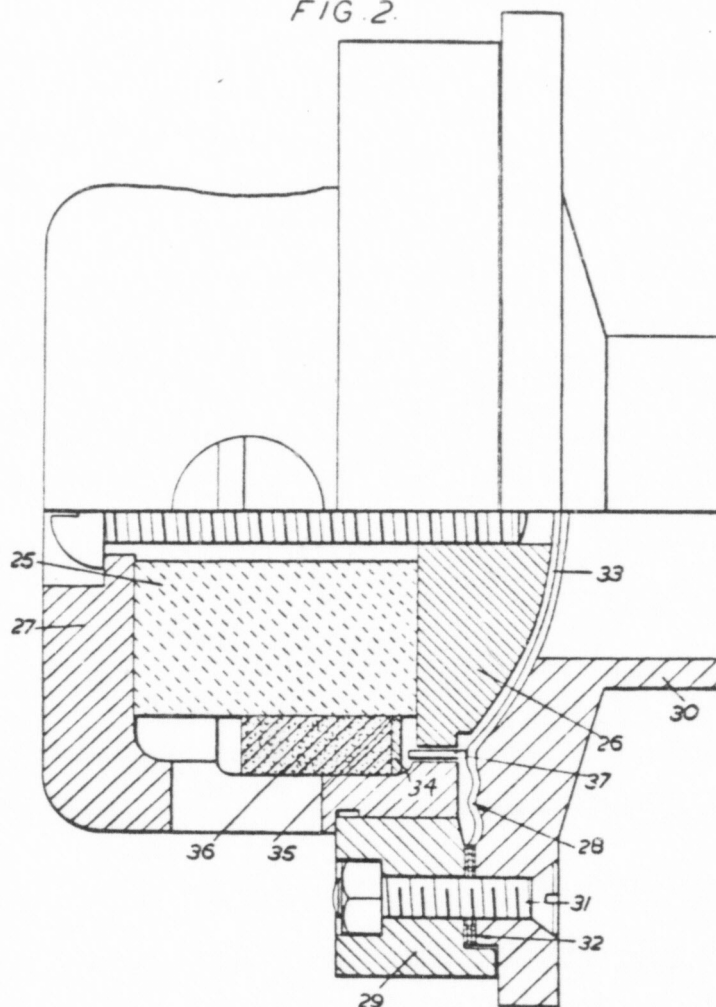
R. H. RACKHAM ET AL  
MICROPHONES

2,717,932

Filed Aug. 8, 1951

2 Sheets-Sheet 2

FIG. 2.



Inventors  
RONALD HASTINGS RACKHAM, &  
TERENCE BRIAN LIVINGSTONE,  
By  
*Stone, Boyden & Inack*  
Attorneys

1150

ORDERING INFORMATION

APPLICATION/DESCRIPTION

Model Numbers

	R-61A	R-70A	R-71A
--	-------	-------	-------

1

2,717,932

## MICROPHONES

Ronald Hastings Rackham and Terence Brian Livingstone,  
West Norwood, London, England, assignors to Tannoy  
Limited, West Norwood, London, England, a British  
company

Application August 8, 1951, Serial No. 240,852

Claims priority, application Great Britain August 14, 1950

11 Claims. (Cl. 179-179)

With the increasing public use of microphones, such as by entertainers, public speakers and others, the need has developed for microphones for public use which will be as unobtrusive as possible when placed in front of the user, and especially the user's face, in order to avoid distracting the audience, and indeed the user also, from the user's performance or delivery. Such an unobtrusive microphone is particularly desirable for entertainment purposes.

An object of the present invention is to provide an improved microphone which will meet these and similar requirements.

According to the present invention, there is provided a microphone comprising a casing in which an electro-acoustic transducer of the pressure microphone type is housed opposite an aperture in the casing to which a tube extending from the casing is attached at one end so as to be acoustically coupled at that end to the transducer to form an acoustic transmission line thereto, the tube being open at its other end and provided therein with acoustic damping means for preventing sound reflections from the open end of the tube.

A microphone embodying the invention may be constructed as a stand microphone such as is required for standing on a floor, table or the like. In such embodiments, the casing and tube form a stand, of which the casing constitutes the base and the tube constitutes the stem. A microphone according to the invention may, however, also be constructed as a portable hand microphone. In contrast to an ordinary stand microphone or hand microphone in which the stem of the stand, or the handle, as the case may be, has the purely mechanical function of supporting the transducer at the requisite position in front of the user, the function of the tube in a microphone according to the present invention is not to support the transducer, since that is housed in the casing or base of the device, but to serve for transferring the transducer diaphragm, in effect, to the open end of the tube. The non-directional characteristics of the pressure type of transducer are retained with this arrangement, which behaves as though a miniature pressure microphone were at the open end of the tube.

According to a feature of the invention, the transducer is mechanically isolated from the casing and the tube, so as to prevent transmission of mechanical vibrations from the tube and casing to the transducer. This isolation may be achieved by providing sponge rubber or similar vibration-absorbing packing in the mounting of the transducer in the casing, so that the packing is interposed between the transducer and the parts of the casing to which it is fixed. If desired, similar packing may be provided between the tube and the casing in order to isolate these two parts against the transmission of mechanical vibrations.

The tube may be made of any suitable material, and as desired or according to the purpose for which the device is to be used, the tube may be rigid, or composed of telescopic rigid sections, or composed of

2

universally jointed rigid elements so as to be flexible as a whole, of such a character as to "stay put" and be self-supporting in any position to which it is adjusted, so long, however, as its material in every case is sufficiently rigid, in the sense of possessing sufficient mass, to avoid the production of acoustic resonances by mechanical vibration of the tube material longitudinally or laterally. As one example, for a stand microphone the tube constituting the stem of the stand may comprise two telescopic rigid sections, viz., a lower section of, e. g.,  $\frac{1}{2}$ " outside diameter and, e. g., 3 ft. in length secured to the casing forming the base of the stand, and an upper section of, e. g., 2 ft. in length telescoped within the lower section. The length of the tube is not critical and may be varied in the ratio of approximately 2:1 (as in the case of a telescopic tube) without need for altering the amount of damping provided at its open end. The amount of damping provided is that which is sufficient effectively to damp out the fundamental resonance of the tube which is dependent on its length. The damping means may consist of a plug, disc, or nodule of cotton wool, acoustic felt, or other customary acoustic damping material.

The transducer housed in the casing may be a normal type of moving coil pressure microphone provided with a throat, the clearance of the throat on the microphone being made small, preferably not greater than .005". However, in order that the desired frequency response may be obtained from the electro-acoustic transducer, together with its associated tube, it is essential that this transducer should have a frequency characteristic which rises sharply in the upper frequency range. In order that this may be satisfactorily achieved, a small cavity, which is formed by the spacing between the diaphragm and pole-tip assembly, is released to the main cavity and its associated damping through a very small orifice of a controlled size. In the event of there being a very large difference in the length of the tube to be employed for different uses of the same transducer unit, the main microphone damping may have to be adjusted.

The transducer is mounted with sponge rubber packing, as above described, in the casing opposite the aperture therein over which one end of the tube is fitted opposite the throat. For attaching the tube, it may be provided with a flange at its fixing end which abuts, if desired with the interposition of an annular sponge rubber packing, against the end of an externally screw-threaded neck on the casing around its aperture, a gland nut engaging over the flange being screwed on to the neck to secure the tube to the casing. If desired, the casing may also house matching equipment, such as a transformer, for the transducer.

Over the open end of the tube is fitted a domed screen, or so-called "mushroom," for the purpose known as "de-plopping," that is to say, for preventing the effect caused by D. C. air impulses on the open end of the tube, such as are produced by explosive consonants, which have the effect of producing a "plopping" sound in the reproducing loudspeaker. This mushroom is made of silk or similar sheer fabric laid over a domed metal gauze grille provided for lending mechanical support to the fabric. It will be understood, of course, that a gap is left between the underside of the mushroom and the open end of the tube. To maintain the high frequency response of the complete microphone, it is desirable to flare the open end of the tube, in order to increase its effective pick-up area.

However, a microphone according to the invention is constructed, whether as a stand or hand microphone or otherwise, in every case, by means of the invention, the actual transducer is positioned away from the user's face and the user merely holds or has in front of him the open

1151

end of the tube, which behaves as through it were a miniature pressure microphone. For hand microphones, the casing housing the transducer, and also its ancillary equipment if desired, may be arranged for portability in any convenient way and position on the user's person, so that the tube, which may for this use be flexible, can be held in the hand to bring its open end in the position which with normal types of hand microphone, is occupied by the microphone itself.

In order that the invention may be more clearly understood, one embodiment thereof will now be described by way of example with reference to the accompanying drawing in which:

Fig. 1 shows a view, partly in section, of a microphone constructed according to the invention and

Fig. 2 shows a view, partly in section, of one form of transducer unit.

The microphone comprises a circular dome-shaped base or casing 1, which may for example be cast from metal or moulded from synthetic resin material, and which is provided with an aperture 2 in the centre of the domed surface. The electro-acoustic transducer unit 3 of the pressure microphone type is mounted within the base 1, being located in alignment with the aperture 2 by a sponge rubber locating ring 4 and held in position by a sponge rubber block 5 located between the bottom of the unit 3 and a plate member 6 which covers the underside of the base 1 and to which it is attached, for example by screws or in any other convenient manner. The base may also house a matching transformer 7, the external cable or connections being made through a socket member 13 also fixed to the base 1.

The top of the base is formed with an upstanding externally threaded neck portion 8, which is coaxial with the aperture 2. Within the neck 8 is fitted one end of a section of tube 9, the end of the tube abutting against a shoulder 10 provided within the neck portion and the tube being secured by means of a gland nut 11 which is screw-threaded over the neck portion 8, a clamping ring or spring washer 12 being interposed between the neck portion 8 and the nut 11 securely to hold the end of the tube 9.

Within the upper end of the tube 9 telescopically slides the lower end of a further tube 14, such that the tube 14 can be telescoped partially within the tube 9. The upper end of the tube 9 is externally threaded and is provided with a locking ring 15 and a spring washer 16, which, when tightened, securely hold the tube 14 in relation to the tube 9. The outer surface of the locking ring 15 is knurled so that this may be easily turned by the fingers and loosened or tightened when it is desired to adjust the height of the tube 14.

Tube 14 is curved at its upper end 17, to which is fitted a flared end portion 18. The mouth of the end portion 18 is covered with a gauze grille 19 backed by a piece of silk 20, the gauze and silk being mounted in a ring 21 which is spaced away from the end of the flared mouth by spacer members 22 so that an annular gap is left between the underside of the ring 21 and the mouth of the flared end portion 18. Damping means comprising a disc of acoustic felt 23 is provided at the upper end of the tube 14, being held in position by the flared end portion 18.

The microphone described is intended as a floorstand microphone and the plate member 6 is provided with rubber feet 24. The curving of the tube 14 brings the flared end 18 conveniently positioned near to the mouth of a speaker. The stem comprising the telescopic tubes 9 and 14 may be adjusted to alter the height of the microphone for different users.

The transducer unit 3 may be constructed as shown in Fig. 2 of the drawing, which construction provides a transducer having a frequency characteristic which rises sharply in the upper frequency range. The transducer comprises a cylindrical magnet 25, provided with a pole

piece 26, and surrounded by a magnet cup 27. The circular diaphragm 28 which is made from Duralumin foil, extends over the face of the pole piece 26, and its periphery is clamped between a moulded Bakelite ring 29 secured to the magnet cup 27 and an annular throat member 30, by means of nuts and bolts 31. Annular spacing rings 32 are arranged between the molded synthetic resin ring 29 and the periphery of the diaphragm, and between the throat member 30 and the periphery of the diaphragm. The speech coil 37 supported from the diaphragm 28 is located in the annular magnetic gap between the pole piece 26 and the magnet cup 27.

To obtain the rising frequency characteristic the small cavity 33 between the pole piece and the diaphragm is connected to the main cavity in the casing through a small gap 35 provided between the inner edge of a sealing ring 34, which is disposed between the cylindrical magnet 25 and the magnet cup 27, and the outer wall of the cylindrical magnet 25. The space between the magnet and the magnet cup on the side of the sealing ring 34, remote from the speech coil is packed with an acoustic felt damping material 36.

The frequency response can be adjusted by adjusting the size of the gap between the sealing ring 34 and the outer wall of the cylindrical magnet 25.

Whilst a particular embodiment has been described, it will be understood that various modifications may be made without departing from the scope of the invention. For example, the base housing the transducer may be so styled as to be suitable for use as a table or desk stand, and may, with the addition of extension pieces, and/or of longer or more tubes, be adapted for use as a floor stand microphone.

We claim:

1. A microphone comprising a casing provided with an aperture, a pressure-operated electro-acoustic transducer within said casing opposite said aperture, a tube extending from the aperture in the casing matching means between said transducer and said tube, a screen comprising a layer of fabric fitted over the open end of said tube, a gap between said screen and the open end of said tube, and acoustic damping means extending transversely across said tube.

2. A microphone comprising a casing provided with an aperture, a pressure-operated electro-acoustic transducer within said casing opposite said aperture, a tube extending from the aperture in the casing, said tube having a flared portion at its open end matching means between said transducer and said tube, and acoustic damping means arranged transversely across said tube adjacent said flared end.

3. A microphone comprising a casing provided with an aperture, a pressure-operated electro-acoustic transducer within said casing opposite said aperture, a tube comprising at least two telescopic sections extending from the aperture in the casing, vibration-absorbing means supporting said transducer within said casing opposite said aperture matching means between said transducer and said tube, and a disc of acoustic damping material arranged transversely across said tube.

4. A microphone comprising a casing provided with an aperture, a pressure-operated electro-acoustic transducer within said casing opposite said aperture, a tube comprising at least two telescopic sections extending from the aperture in the casing, a screen comprising a grille supporting a layer of fabric fitted over the open end of said tube, a gap between said screen and the open end of said tube matching means between said transducer and said tube, and acoustic damping means arranged transversely across said tube.

5. A microphone comprising a casing provided with an aperture, a pressure-operated electro-acoustic transducer within said casing opposite said aperture, a tube extending from the aperture in the casing matching means between said transducer and said tube, vibration-absorbing means

1152



5

supporting said transducer within said casing opposite said aperture, a screen comprising a layer of fabric fitted over the open end of said tube, a gap between said screen and the open end of said tube, and acoustic damping means arranged transversely across said tube.

6. A microphone comprising a casing provided with an aperture, a pressure-operated electro-acoustic transducer within said casing opposite said aperture, a tube comprising at least two telescopic sections extending from the aperture in the casing matching means between said transducer and said tube, vibration-absorbing means supporting said transducer within said casing opposite said aperture, a screen comprising a grille supporting a layer of fabric fitted over the open end of said tube, a gap between said screen and the open end of said tube, and a disc of acoustic damping material arranged transversely across said tube.

7. A microphone comprising a casing provided with an aperture, a pressure-operated electro-acoustic transducer within said casing opposite said aperture, a tube comprising at least two telescopic sections extending from the aperture in the casing matching means between said transducer and said tube, vibration-absorbing means supporting said transducer within said casing opposite said aperture, a flared end portion fitted to the open end of said tube, and a disc of acoustic damping material arranged transversely across said tube.

8. A microphone as claimed in claim 7 wherein the transducer unit has a frequency response which rises sharply in the upper frequency range.

9. A microphone comprising a casing provided with an aperture, a pressure-operated electro-acoustic transducer within said casing opposite said aperture, a tube extending from the aperture in the casing matching means between said transducer and said tube, vibration-absorbing means supporting said transducer within said casing opposite said aperture, said tube having a flared portion at its open end, a screen comprising a layer of fabric fitted over the mouth of said flared end portion, a gap between said screen and the mouth of said flared end

6

portion, and a disc of acoustic damping material arranged transversely across said tube.

10. Apparatus as claimed in claim 9, wherein the electro-acoustic transducer comprises a moving coil pressure microphone comprising a casing, an annular throat member attached to said casing and forming said matching means, a magnetic pole assembly having an annular air gap, housed within said casing, a diaphragm, a coil attached to said diaphragm and positioned in said air gap, and a small orifice connecting the cavity formed by the spacing between said diaphragm and the central pole surrounded by said air gap with the cavity between said microphone and said casing.

11. Apparatus as claimed in claim 9, wherein the electro-acoustic transducer comprises a moving coil pressure microphone comprising a casing, an annular throat member attached to said casing and forming said matching means, a magnetic pole assembly comprising a central magnet and a surrounding magnet cup housed within said casing, an annular air gap between said central magnet and said magnet cup, a circular diaphragm, a coil attached to said diaphragm and positioned in said air gap, a sealing ring behind said annular air gap and between said central magnet and said magnet cup, a small gap between the inner edge of said sealing ring and the outer wall of said central magnet and acoustic damping means between said central magnet and said magnet cup adjacent said sealing ring on the side of said sealing ring remote from said speech coil.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

1,584,038	Kornsweet	May 11, 1926
1,818,654	Stewart	Aug. 11, 1931
2,010,566	Schnetz	Aug. 6, 1935
2,238,741	Lauffer	Apr. 15, 1941
2,239,503	Kreuzer	Apr. 22, 1941
2,293,078	Proctor	Aug. 18, 1942
2,485,405	Olney et al.	Oct. 18, 1949

1153

Oct. 18, 1966

D. W. FLYGSTAD ETAL

3,280,273

SELF-SUPPORTING OPERATOR'S HEADSET

Filed Sept. 11, 1963

2 Sheets-Sheet 1

FIG. 1



FIG. 2

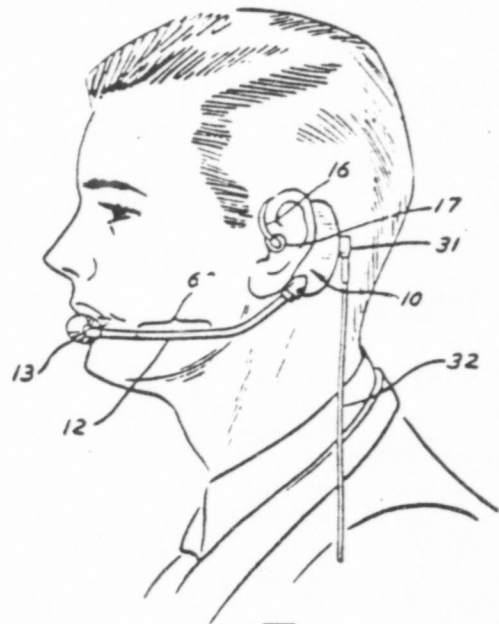


FIG. 3

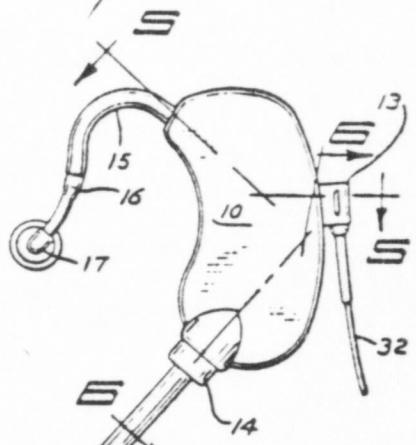
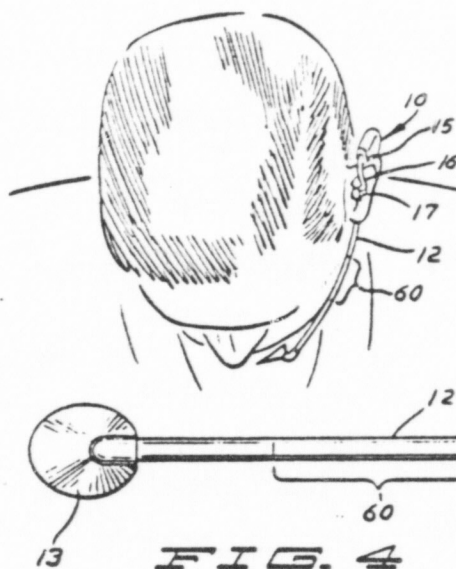


FIG. 4

INVENTORS  
DEAN W. FLYGSTAD  
BY ROBERT L. SELL  
Carlson, Carlson & Sturges  
ATTORNEYS

CHARLARD DEPO EX.# 3

11/8/73  
UL

1154

Oct. 18, 1966

D. W. FLYGSTAD ETAL

3,280,273

SELF-SUPPORTING OPERATOR'S HEADSET

Filed Sept. 11, 1963

2 Sheets-Sheet 2

FIG. 7

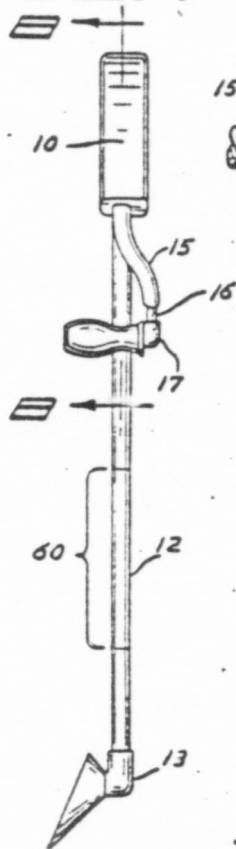


FIG. 5

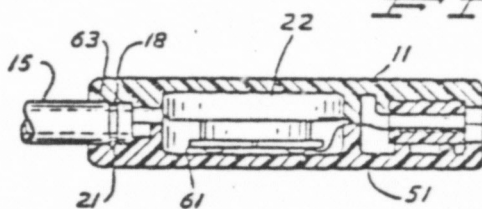


FIG. 6

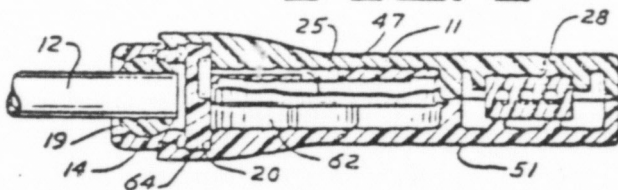


FIG. 8

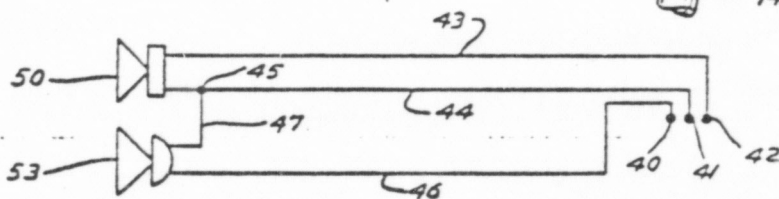
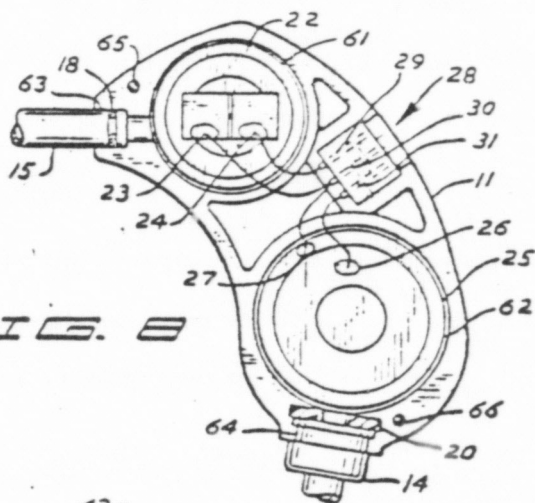


FIG. 9

INVENTORS  
DEAN W. FLYGSTAD  
BY ROBERT L. SELL  
Carlson, Carlson & Stuenkel  
ATTORNEYS

1155



3,280,273

## SELF-SUPPORTING OPERATOR'S HEADSET

Dean W. Flygstad, Roseville, and Robert L. Sell, Minneapolis, Minn., assignors to The Telex Corporation, Tulsa, Okla., a corporation of Delaware  
Filed Sept. 11, 1963, Ser. No. 308,240  
8 Claims. (Cl. 179—156)

This invention relates generally to two-way communication apparatus and is more particularly related to apparatus containing a receiver and a microphone that is intended to be worn by an operator.

In the prior art with which this invention is concerned, much effort has been directed to provide lightweight, comfortable and efficient headsets to be used, for example, by telephone operators. One common feature found in the prior art is an intermediate supporting structure to hold a receiver in sound transmitting relationship with an operator's ear and a microphone in sound receiving relationship with an operator's mouth. One recent example of such supporting structure is a headband which extends up and across a substantial portion of the top of an operator's head. Another example supports the necessary apparatus on the bow, or temple member, of a pair of eyeglasses. In still another example, a receiver may be supported on a headband and a microphone may be supported in structure adapted to be suspended around the operator's neck. These and other examples of the prior art may be found lacking in one or more of the desirable features noted above.

In our invention, we have provided a novel and useful improvement in providing a self-supporting headset. Briefly, our apparatus includes a housing that has depending sound conducting members, for supporting and stabilizing the headset on the head of an operator, and a suitably mounted receiver and microphone, all of which coact to provide a combination of elements that is lightweight, comfortable and efficient.

It is therefore an object of our invention to provide a novel operator's headset.

It is a further object of our invention to provide a self-supporting operator's headset.

These and other more detailed and specific objects will be disclosed in the course of the following specification, reference being had to the accompanying drawings, in which—

FIGS. 1-3 illustrate a preferred embodiment in position on an operator's head.

FIG. 4 is a side elevational view of the preferred embodiment of our invention.

FIG. 5 is a sectional view taken along section lines 5-5 in FIG. 4.

FIG. 6 is a sectional view taken along section lines 6-6 in FIG. 4.

FIG. 7 is a plan view of the preferred embodiment of our invention.

FIG. 8 is a sectional view taken along section lines 8-8 in FIG. 7.

FIG. 9 is an illustrative electrical schematic drawing of the electrical portion of our invention.

Referring now to the drawings in which like reference numerals have been applied to like elements of our invention, there is shown a self-supporting operator's headset comprised of a housing 10 which may contain a receiver 22 and a microphone 25 that are appropriately positioned to coact with a forwardly extending tube member 15 and a second forwardly extending tube member 12. Tube member 15 is in turn connected to a further tube member 16 that is adapted to carry an ear insert 17. Tube member 12 is mounted in a ball 19 and socket 14 and extends forwardly from the lower end of housing

10 and carries at its forward end a megaphone 13. Tube 12 is adapted to engage the cheek of an operator at a point or points along its length as indicated by bracket 60.

As will be apparent from the drawings, housing 10 is comprised of a pair of substantially identical members 11 and 51 which, when suitably disposed, combine and coact to define a pair of acoustically independent transducer mounting chambers 61 and 62 at opposite ends of the assembled housing 10. A further chamber is provided intermediate the acoustically independent chambers for mounting a three-terminal jack, indicated generally by the reference character 28.

Chamber 61 is adapted to receive and hold a receiver 22 having a pair of input terminals 23 and 24 that are connected through suitable conducting means to a further pair of terminals 29 and 30 on jack member 28. Chamber 61 also includes a forwardly extending aperture 63 which is adapted to receive the end of tube member 15.

Chamber 62 is adapted to receive and mount a microphone 25 which is provided with a pair of output terminals 26 and 27 that are connected through suitable conductors to terminals 30 and 31 on jack member 28. Chamber 62 also includes a generally forwardly extending aperture 64 for receiving socket 14 and sound baffling member 20. A further sound baffling member 47 is shown positioned at the bottom of chamber 62 on member 11. Sound baffling member 20 includes a first slot extending completely through and a second groove extending partly through member 20 to define an opening which is adapted to coact with a radially extending channel on the lower surface of baffling and gasket member 47, which in turn is in communication with a centrally located aperture for transmission of sound to microphone 25.

Member 11 also includes upwardly extending locating pin members 65 and 66 which are adapted to coact with similarly positioned apertures in member 51 to provide suitable registration of members 11 and 51 for assembling the apparatus. Members 11 and 51 may be assembled to form housing 10 after receiver 22, microphone 25, baffles 47 and 20 and jack 28 are positioned and suitably interconnected and may be cemented together through the use of any suitable adhesive which will provide the desirable acoustical insulating properties to ensure acoustical isolation between chambers 61 and 62.

Tube 15, which may be comprised of any suitable semi-rigid plastic material, is provided with a groove 18 which may coact with a pin member 21 mounted in member 51 so as to allow rotation of tube member 15 in aperture 63. Tube member 15 is, in turn, connected to a further tube member 16, which may be of a pliable material. An earplug 17 is shown mounted on the end of tube 16 and may be of suitable shape and compliance to be comfortably inserted in the auditory canal of an operator.

Tube member 12 is held in ball 19 through the use of a suitable adhesive. Ball member 19 is in turn rotatably journaled in a socket 14 which is in turn positioned and held in aperture 64 at the lower end of housing 10. Tube member 12 may also be comprised of a semi-rigid plastic material and has mounted at its forward end a megaphone 13 that is adapted to receive sound from the mouth of an operator and may be of any suitable size and shape.

In FIG. 4 of the drawing a suitable three-conductor plug member 31 is shown in position on jack 28 and is in turn connected to a suitable cable 32 that may be connected to suitable communication equipment which includes a source of signal and signal utilization means.

In FIG. 9 an electrical schematic representative of circuitry that may be employed with our invention is shown. A three-terminal plug represented generally by

1156

reference characters 40, 41 and 42 is shown connected in circuit with a microphone 53 and a receiver 50, each of which has a pair of terminals. One of the terminals on receiver 50 is connected to terminal 41 through conductor 44 and is also connected to one of the terminals on microphone 53 through terminal 45 on conductor 44 and conductor 47. The other terminal on receiver 50 is connected to terminal 42 through conductor 43. The second terminal on microphone 53 is connected to terminal 40 through conductor 46.

It may thus be seen that our invention broadly includes a housing 10 which may have a first forwardly extending tube member 15 and a second forwardly extending tube member 12 and a jack 28 for connection to suitable communications equipment through cable 32.

Referring now to FIGS. 1, 2 and 3, our invention is shown in position on the head of an operator. Housing 10 is positioned directly behind the ear of the operator and tube member 15 extends forwardly to lie on the top of the ear and thence downwardly to provide a coupling to the auditory canal of the operator. Tube member 12 extends forwardly into engagement with the cheek of the operator along the area indicated by reference numeral 60 and the megaphone 13 is positioned in proximity to the mouth of the operator in a position which will provide for the most efficient transfer of intelligible sound energy from the particular operator using our apparatus.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described our invention, what we claim to be new and desire to protect by Letters Patent is:

1. An operator's headset comprised of an elongated hollow housing containing a receiver and a microphone, said housing being shaped to lie behind the ear of an operator, said housing also having a tubular portion extending forwardly from its top over the ear of an operator and into proximity of the auditory canal, said housing also having a tubular portion extending forwardly from its lower end into contact with the face of the operator and into proximity of the mouth of the operator whereby the housing is supported solely by the ear and face of the operator.

2. An operator's headset comprising: a housing having a portion adapted to engage the back of the ear of an operator, said housing being vertically elongated and having separate chambers in proximity to the top and bottom ends thereof, each of said chambers having an aperture extending generally forwardly thereof; a microphone in the bottom chamber; a receiver in the top chamber; a tube extending forwardly of the aperture in said top chamber to lie on top of the ear and downwardly to extend into the auditory canal of an operator; a further tube extending generally forwardly of the aperture in said bottom chamber, said tube being adapted to lie on the cheek and extend into proximity of the mouth of an operator.

3. The apparatus of claim 2 in which the further tube is pivotally mounted in the aperture in said bottom chamber.

4. The apparatus of claim 3 in which the tube extend-

ing from the top chamber is rotatably journaled in the aperture.

5. The apparatus of claim 2 in which first and second resilient gaskets, each having sound energy transmitting channels and apertures, coact to provide a conduit for the transmission of sound from the aperture on the bottom end of the housing to the diaphragm of the microphone mounted therein.

6. An operator's headset comprising in combination: a hollow housing including terminal means for connection to a source of signal and a signal utilization means, said housing being of generally arcuate shape to lie behind and engage the ear of an operator; a first forwardly and downwardly extending tube member at the top of said housing, said tube member being adapted to engage the ear of an operator along a portion of its length and co-operating therewith to support the housing on said ear; sound receiving means electrically associated with said terminal means, and associated with said tube member to supply sound energy to the auditory canal of an operator; a second forwardly extending tube member at the bottom of said housing, said tube member being adapted to engage the side of the face of an operator and having an opening adapted to be positioned in sound receiving relationship to the mouth of an operator; and microphone means electrically associated with said terminal means and associated with said second tube member to receive sound energy from the mouth of an operator.

7. An operator's headset comprised of a housing member adapted to abut the rear portion of an operator's ear; a forwardly extending tube member adapted to extend over the top of an operator's ear; a further tube member extending forwardly into proximity with the mouth of an operator and adapted to lie in engagement with the cheek of an operator, said housing and tube members cooperating to support and stabilize the headset on the ear of an operator.

8. Improved self-supporting communication apparatus comprising in combination: a microphone and receiver; a hollow housing including forwardly extending sound conducting members, one of said members being adapted to engage the top of the ear of an operator and to apply sound energy to said ear, and the other of said members extending into proximity of the mouth of an operator and being adapted to engage the cheek of an operator whereby said hollow housing is supported only by said sound conducting members; and means mounting said microphone and said receiver in said housing in acoustically independent relationship so that said one member provides sound energy to the ear of an operator and said further member receives sound energy from the mouth of the operator.

#### References Cited by the Examiner

##### UNITED STATES PATENTS

2,904,640 9/1959 Dreher et al. 179-156  
184,556 5/1965 Larkin 179-156

KATHLEEN H. CLAFFY, Primary Examiner.

WILLIAM C. COOPER, Examiner.

1157



March 2, 1967

Mr. M. Schiavoni  
Engineering Director - Customer Telephone Systems  
American Telephone & Telegraph Company  
195 Broadway  
New York, New York 10007

Dear Mr. Schiavoni:

SUBJECT: Lightweight Headset Considerations - Bell System Operators

PURPOSE:

Pacific Plantronics, Inc., has supplied lightweight headsets utilizing the two tube, two transducer concept to the Bell System under NS number for the System's lease customer use since September, 1965. A resultant demand for a unit utilizing these same concepts has grown from within the Bell System by its internal operators for such a device. The object of this presentation is to request the American Telephone & Telegraph Company's consideration of PPI as a supplier of these internal needs along the following possible lines:

1. The development and production by PPI of a unit as conceptually illustrated in attendant illustrations 1A and 1B, with attached unit description, see Attachment I. Covered by Patent 3,184,555, see Attachment II. PPI experience and hearing aid industry experience would indicate a much higher level of user acceptance of the universal soft ear tip design as employed in this NS-50 concept as opposed to the attendant problems of individual casting of complete ear molds for each individual user's ear, as is inherent in the design under Item 2, NS 51 earmold headset.
2. Or, the refinement and production of the NS 51/T56, see Attachment III with accompanying Photographs 1D and 1E, (earmold mounted unit with idle gain reduction amplifier), covered by Patent 3,184,556.
3. Or, the production by PPI of Bell Labs preferential designs utilizing these patented concepts.

continued.

CHOCINARD DEPO EXH 11  
11/8/73  
VCO  
6667  
EP 0860

1158



March 2, 1967

- 2 -

The above Proposal for consideration in this latter are offered on a non-confidential basis.

#### HISTORY:

Pacific Plantronics was formed in late 1961 to design, develop and market lightweight headsets to the Telecommunications, O.E.M., and Federal and Aerospace market segments. Major customers include projects Mercury, Gemini and Apollo astronauts; United Air Lines, Pan American World Airways jet fleets; North American Aviation; the Bell System, General Telephone System, and the Independent Telephone companies. An entire series of concepts under Patent number 3,184,556, see Attachment II, were evaluated prior to entering the market place with the HS 50, see Attachment IV. (The Evolution of the KS 19796 Headset.) Bell System use of this basic configuration commenced with Pacific Telephone & Telegraph in early 1963, and some 18,000 units designated HS 30/T54 were sold. The first KS numbered units, HS 50/T55, were introduced in September, 1965. Since then over 50,000 such units have been delivered representing 60.5% of PPI total business in this time period.

#### COST CONSIDERATIONS:

Based on an assumed decision to physically separate the basic headset module from the amplifier module, with the supposition that the amplifier is a station issue and the headset is operator personal issue, certain headset target prices can be estimated. For example, a unit of the HS 51 configuration terminated separately from the amplifier module with a planned production in excess of 250,000 units with transducers estimated at \$8 per pair, would indicate a target price approaching \$25 per unit. Transducer prices are the leverage factor in any price analysis and the availability of lower cost transducing units would probably alter any cost considerations.

#### PPI CORPORATE PLANNING CONSIDERATIONS:

At this point in time, PPI is dependent upon the Bell System for sixty percent of its business. The acceptance by the General Telephone Company and the balance of the independent telephone companies of PPI products also largely rests on Bell System's KS acceptance. It is the express policy of PPI Directors and Management to reduce this dependency. An engineering group within PPI has been created with the sole mandate to develop products other than telephone headsets. A highly qualified consulting group outside of Pacific Plantronics has been retained to identify suitable products of outside companies, and to bring these into the PPI household by outright purchase or merger. Thus, it is the policy of PPI to relieve a one-product, one-customer dependency, as evidenced in our Bell System relationship, as rapidly as possible and to establish a posture more comfortable to both PPI and the Bell System.

continued.

6666  
EP 0859

1159

February 23, 1967

- 3 -

PPI CORPORATE PLANNING CONSIDERATIONS - continued.

PPI, through continuing contact with the Bell System, has been made aware of a new CYL lightweight headset, the Model DP, undergoing field evaluation. We are apprised that the Bell System Planning calls for the introduction of this unit in late 1967, both to Bell System internal operators and to the system's inside customers. The impact of such a plan upon PPI would be to virtually eliminate its sales to the telephone market. (True even if PPI units are continued to be offered.) We are of the opinion, based upon extensive discussion with our patent counsel that the features of the Model D headset fall under the inventive concepts of Larkin Patent 3,134,586. The above considerations are brought to your attention in recognition of the well developed Bell System image in its fair treatment of qualified suppliers.

\*Substantially the same concept as evaluated by PPI in 1962, see Attachment IV, MS 51, earmold constitutes tube to ear connection.

QUALIFIED SUPPLIER CONSIDERATIONS:

PPI has proven itself an on-time quality supplier to the Bell System. Original demand estimates, as provided PPI by the Western Electric Company, would have called for production of some 20,000 units through the current date. PPI has delivered a fine product, 50,000 units, on time against a demand over 2-1/2 times that originally estimated. It is our position, with pride, that we are a supplier well qualified technically with the capacity to effectively service the Bell System's internal headset requirements consistent with quality, delivery and cost requirements imposed.

Sincerely,

PACIFIC PLANTRONICS, INC.

C. P. Graham  
President

CPG:jms

Attachments

6665  
EP 0858

1160

# MINIATURE OPERATORS HEADSETS

ROANWELL CORPORATION



R-61



R-70



R-71

CHECKARD DEL  
111817) 1161



#### APPLICATION/

Headset with 5 ft.

Headset with switch

#### MINIATURE HEADSETS FOR VARIOUS APPLICATIONS

#### NOISE-CANCELLING TRANSMITTER

52 Type Headsets

RN-1C

on, Noise-Cancelling Trans

work area is noisy

#### ROADWELL CORPORATION

In two decades Roadwell has established a reputation as the foremost manufacturer and supplier of quality headsets, handsets and microphones.

Roadwell products have satisfied existing customer requirements throughout the communications industry. Applications range from worldwide telephone service to air, land and sea; from ground and air aboard tracking operations; from military and police work to the on-the-job use of the business man; from television coverage to intercoms; from radio stores and department controllers to stock brokers.

These products, and many others, have solidified Roadwell's leadership in the communications field.

Now, three new additions to the headset family take their place among Roadwell's established and well-known products: Models R-61, R-70 and R-71. These new miniature headsets — lightweight, comfortable, rugged and reliable — represent the latest contribution to the field of voice communications equipment.

Transmitter and receiver sections are cleaner and simpler thanks to solid-state circuitry and rugged, high-performance transducers designed specifically for use in the telecommunications network.

A lanyard is supplied with each headset to support the lightweight cord and plug assembly. Each of the three new headsets has been designed to eliminate any requirement for a telephone, assuring comfort and convenience for the operator.

#### WE ARE PROUD TO PRESENT THESE NEW HEADSETS:

Models R-61, R-70 and R-71

#### PERFORMANCE CHARACTERISTICS

The latest in miniature transmitter and amplifier design combined with Bell Telephone and Western Electric Transducer products satisfy the highest transmission and reception standards for the communications field.

#### TRANSMITTER/PREAMPLIFIER

Output — 112 dBm across 60 ohm load for SPL input of 94 dB.

Frequency Response — 400 to 4,000 Hz.

Impedance — 50 Ohms nominal at 1,000 Hz.

Voice-Switch Adjustment — Decrease in dB for sensitivity of 12 dB when sound pressure level drops below normal speaking level.

Voltage Switching — DC voltage sensing circuit automatically adjusts amplifier gain for presence or absence of transmitter to operate turret.

Operating Voltage — 12 to 14.5 Volts DC.

#### SURGE PROTECTED RECEIVER

Sensitivity — 112 dBm into 600 ohm load (ASA-H42).  
Measured at -20 dBm input.

Frequency Response — 200 to 4,000 Hz.

Impedance — 600 Ohms at 1,000 Hz.

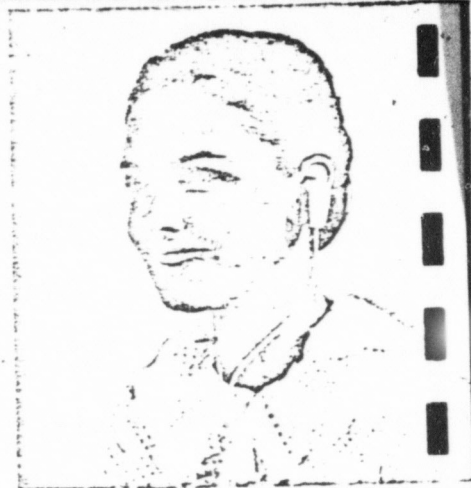
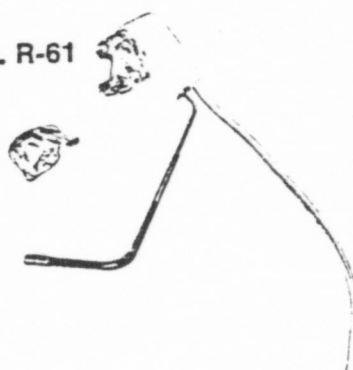
The versatile solid state amplifier utilizes a voice operated switch to discriminate against background noise. It also incorporates gain compensation for a wide range of operating voltage and input signal conditions.

The transmitter and receiver elements, designed for long and reliable service under conditions of rapid handling and continuous operation, have provided their customers with quality and ruggedness in equal measure.

1162

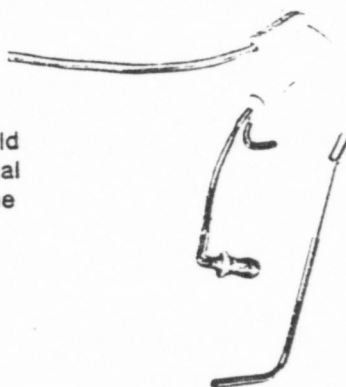
### NEW MINIATURE HEADSET, MODEL R-61

This Roanwell headset is mechanically and electrically interchangeable with the Western Electric Model 61-A. It is supported by the operator's own earmold, assuring optimum performance and maximum comfort.



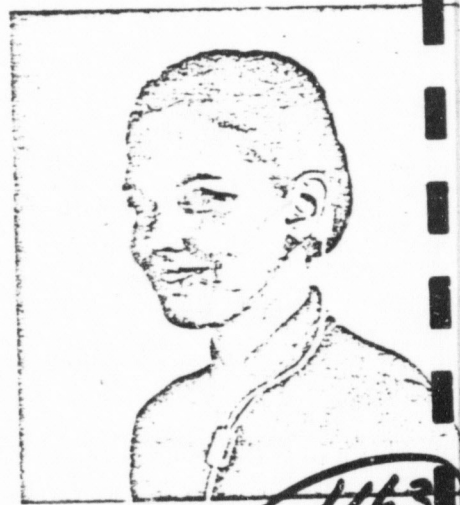
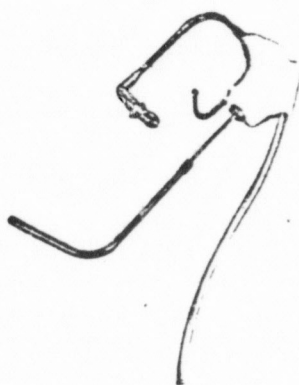
### THE ROANWELL MODEL R-70

The new Roanwell Model 70 fits snugly and securely behind the ear. Standard size soft-tip ear plugs replace the earmold of the 61-A for coupling the receiver signal to the ear and an over-the-ear voice tube is employed. The basic performance characteristics of Model R-61 are retained in this unique headset.



### ROANWELL'S MODEL R-71

This new headset is another exclusive Roanwell design. The below-the-ear voice tube distinguishes this model which is often preferred by those who wear glasses. The Model R-71 provides the light-weight comfort, the unexcelled ruggedness and the basic performance features of Models R-61 and R-70.



## ORDERING INFORMATION

### APPLICATION/DESCRIPTION

### Model Numbers

Headset with 5 ft. straight cord and twin plug	R-61A	R-70A	R-71A
Headset with switch, 15 ft. coil cord and twin plug	R-61B	R-70B	R-71B

### MINIATURE HEADSETS FOR YOUR APPLICATIONS

R-61A For operators, PBX attendants and busy telephone users who need hands-free communications capability. This version includes a 5 ft. straight cord and connector to mate with standard switchboard jack.

R-61B For supervisors and operators who need extra mobility and versatility in a miniature headset, R-70B this version incorporates an in-line switch and 15 ft. extendable coil cord terminated in the R-396A twin switchboard plug.

### CUSTOM CONFIGURED MODELS FOR SPECIALIZED APPLICATIONS

Integrated manufacturing and in-house design capability enable Roanwell to readily respond to customer requirements for MOH designs in new applications.

Typical applications include:

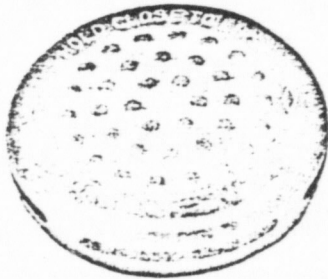
Air Traffic Controllers	Pilots
Dispatchers	Two-way Radio Users
Console Operators	

### NOISE-CANCELLING TRANSMITTERS

For 52 Type Headsets  
the RN-1C  
Carbon, Noise-Cancelling Transmitter

If your work area is noisy, if you have trouble hearing, or if background noise causes cross-talk or noise on the line, order the RN-1C.

The RN-1C cancels an average of 18dB of distracting background noise — makes a call placed from a noisy environment sound almost as quiet as one from a private office.



The Model 52 has been the industry standard for many years. The 52 headset, the three new headsets, 61, 70 and 71 plus our other lines of quality headsets confirm Roanwell's reputation as your **YOUR FULL LINE HEADSET MANUFACTURER.**



### ROANWELL CORPORATION

*Roanwell Building*

180 Varick Street, New York, N. Y. 10014  
Tel: (212) 989-1090 • TWX: 710-581-6555

1164





## THE NEW LIGHTWEIGHT R-61A TELEPHONE OPERATOR HEADSET

Designed by Bell Telephone Laboratories  
Manufactured by Roanwell for the Bell System

The tiny R-61A Headset weighs approximately an ounce because miniature components are used. These earphone and microphone elements provide dependable, long-life performance. The headset is held comfortably in place by a unique ear-support arrangement.

A versatile solid-state amplifier utilizes a voice switching principle to discriminate against background noise. It also incorporates gain compensation over a wide range of operating voltage and input signal conditions.

Because the R-61A is lightweight, it overcomes three important problems telephone operators have faced using headsets of heavier design: discomfort, fatigue and mussed hairdos.

The R-61A Telephone Operators' Headset is scheduled for production in early 1970.

CHOCARD PLSD EXT 6  
11/8/73  
212

ROANWELL CORPORATION 180 Varick Street, New York, N.Y. 10014. • Tel: (212) 989-1090

1165

February 20, 1967

CONFIDENTIAL

Dear Mr. Davies:

The object of this presentation should be to receive a clearly definitive statement of position on lightweight headsets and PFI on this issue from a top policy AT&T individual before the Model D unit becomes generally known.

The following outline is designed to provide background information which may be of some value to you in any discussions with AT&T. Primary subjects in this memo -

- I. Bell System - PFI History
- II. Bell System Current Plans - Model "D" Headset.
- III. Impact on PFI of Current AT&T Model "D" Headset Plans
- IV. PFI First Course of Action - Realignment of AT&T Planning.
- V. Appraisal of PFI Position by Knowledgeable Bell System Employee.
- VI. Possible Bell System Liabilities in this issue.
- VII. Solutions in order of acceptability to PFI.
- VIII. PFI Last Course of Action.

I. Bell System - PFI History

- A. Prototype MS 59 headset delivered to ETL 1962. Unit rejected by PFI because of amplification required and frequency response characteristics of variable reluctance transducer. (See letter A. D. Knowlton, ETL). This letter is important in that it pretty well indicates that ETL really had no design history in this type of unit prior to PFI submittal. Of interest, the new Model D headset

6-664  
EP0850

continued.

CHOGNARD DEPO EX#7

11-8-73  
260

1166

CONFIDENTIAL

- is not only amplified, but also using variable reluctance transducers of almost identical characteristics of those submitted by PFI in 1962. The BTL Model D transducers were purchased from Knowles Electronics, our supplier.
- B. 1963 PFI stimulated Lockheed switchboard operators to request of Pacific Telephone & Telegraph to supply the PFI headset. PT&T agreed to do so and on a regional contract had WECO buy from PFI a limited number of our first switchboard unit the MS 30/T34. PT&T gave PFI a market estimate for one year of 700 units; WECO actually bought over 17,000 to meet initial California demand.
- C. 1963 PFI contacted the Federal Aviation Agency Centers with a specially structured unit for their use, the MS 50/T32. The Bell System objected since the FAA was their customer and they did not wish to have a nationwide lease customer using other than Bell supplied equipment. BTL then suggested they a new and better headset than PFI, called the Y-1. A competitive evaluation between the PFI MS 50/T32, the new BTL Y-1 and the old WECO 52 BW was conducted under the supervision of BTL at Oakland FAA Center. The PFI headset was voted the winner on almost all counts by FAA controllers - see BTL Report. The Bell System nationwide supplies the FAA Centers under lease the PFI MS 50/T32 headset under KS number.
- D. Late 1963, PFI requested AT&T nationwide acceptance of MS 30/T34 for all Bell operating company lease customers. BTL rejected this unit on accurate ground of unit reliability. (i.e., cable failures, flex relief failures, etc.). A new unit, the MS 50/T35, with design improvements was submitted via PT&T. With strong assistance and support from PT&T, AT&T made a decision to accept the MS 50/T35 as a KS product. After almost a year of further BTL design evaluation, KS 19796 number was awarded in late 1964. AT&T forwarded a \$3 per month tariff recommendation to all operating companies and by September of 1965, first orders under our first contract with WECO for the KS 19796 units began. Original WECO-AT&T market estimates called for 10,000 units in the first year. PFI has delivered over 75,000 units since September 1965. I believe it was in early 1965 that BTL began developing their own lightweight unit, the Model D. Primary support for this development effort probably came from Mr. Romanoff, the gentleman at BTL who should have invented the PFI headset and from Mr. Reinen and Mr. Schiavoni of AT&T customer products. Mr. Schiavoni would have been under strong pressure from the Bell System internal operators who were not being provided lightweight headsets while lease customers were. Mr. Romanoff is a living symbol of the BTL NIH factor; his position is understandable.

66636  
EP0849 continued.

1167



CONFIDENTIAL

D. Continued.

After we had received our second contract from Western Electric, I directed a letter to Mr. R. R. Hough, Vice President, AT&T, requesting a statement of position from the Bell System on lightweight headsets and gave him my reasons for this request. (See attachment letters from Graham to Hough, and Williamson to Graham.) This letter of Mr. Williamson's obviously did not give Plantronics any comfort, but we still, at this time, had no idea of what concept Bell Labs was proposing. For example, if Bell Labs came up with an entirely different lightweight headset not using the two-tube, two-transducer approach, there is little that Plantronics could justifiably consider doing. However, the Bell System's Model D headset design took the form of an acoustic tube to the mouth, two transducers mounted in the same approximate area, using a tube to the ear through an ear mold mount. This is one of the early design concepts that Plantronics evaluated. It is obviously an optimum solution inasmuch as it eliminates the requirement for a headband or glasses mount option. It is a less than optimum solution to the human engineering problem in that it requires the individual molding of an earpiece for each individual operator with complicated logistics involved.

Plantronics would have proposed this concept at the outset, hereafter referred to as the MS-51 concept, to the Bell System, except for the resistance we received on any approach requiring insertion into operator's ear. In fact, we received a great deal of resistance from the Bell System on just the use of the universal earcup currently used on the MS 50 lightweight headset.

In conclusion it is accurate to summarize that AT&T policy on lightweight headsets evolved as follows -

1. 1962 - Outright rejection.
2. 1963 - AT&T acceptance, AT&T rejection.
3. 1964 - AT&T rejection and subsequent acceptance.
4. 1965 - AT&T - let's design and build our own.

## II. Bell System Current Plans - Model "D" Headset

✓ The attached PM drawing illustrates the STL Model D headset which is currently undergoing internal Bell System operator use test before final design freeze for production.

6663.5  
EP 0848 continued...

1/68

CONFIDENTIAL

Mr. Schiavoni, Customer Products, intends that -

1. Unit will be introduced in late 1967 to Bell System internal operators.
2. Unit will be tariffed and offered to Bell System lease customers in late 1967.
3. Headset module will be offered separate from plug and amplifier module.

Three points are significant here.

1. The Bell System can make a 500,000 unit plus production decision and ship accordingly -- thus, significantly lower production costs than PFI, since PFI can only produce against limited WECO contract releases.
2. The headset module is to be separate from amplifier plug module wherein the headset becomes operator issue and the amplifier module becomes station issue. PFI was not able to make this type of system decision in its original presentation to the Bell System. Since there are always more than one operator per station, the economics again favor the Bell System headset. As a tariff item, it would price out for less than a PFI unit with amplifier and headset as a complete unit.
3. The Model D uses the ear mold concept. From a customer preference or appeal standpoint, this would tend to sell or lease more easily than the current MS 50, not even considering price.

III. Impact on PFI of Current Model D Headset Plans

A. Bell System headset would offer -

1. More advanced design than current PFI MS 50.
2. Headset separation from amplifier plug module.
3. Noise reduction amplifier.
4. Tariffs to lease customers probably 30 to 50% less than those on PFI headset by the Bell System.

66634

EP 0847

continued.

1169

This offering on the part of the Bell System would effectively relieve PFI of 70% of its market - 60% to the Bell System and 10% to General Telephone and the Independents. Our sales would fall almost immediately from a 6-1/2 million rate to 1-1/2 million rate or less. The effect on PFI stock would certainly be equal or worse.

Although the Bell System's position on this as stated in Mr. Williamson's letter is that they will continue to offer our units, there can be little doubt by any conversant with this market, that current Bell System plans would substantially eliminate PFI as a company.

#### IV. PFI First Course of Action - Realignment of AT&T Planning.

Our first action and probably our best is to reach the very highest area in AT&T with the PFI history and the effect current Bell System planning will have on PFI. Any attempt to go through normal channels on this matter will probably only result in the same reply as offered by Mr. Williamson in his letter of May 11, 1966.

The Plantronics appeal is couched in a standard letter of submission to Mr. Schiavoni requesting consideration of PFI as a supplier to the Bell System of lightweight headsets for their internal operators. It structures our request with three alternatives offered in the sequence most acceptable to PFI.

1. The development and production by PFI of a unit as conceptually illustrated in attendant illustrations 1A and 1B, with attached unit description, see Attachment I. Covered by Patent 3,184,556, see Attachment II.
2. Or, the refinement and production of the MS 51/T56, see Attachment III with accompanying Photographs 1D and 1E, (earmold mounted unit with idle gain reduction amplifier), covered by Patent 3,184,556.
3. Or, the production by PFI of Bell Labs preferential designs utilizing these patented concepts.

The proposal is supplemented with illustrations of proposed hardware, a general description of unit types, target specifications and a careful referencing of these concepts against our patent. One of these alternatives, the MS 51, is configured identically to the Model D STL headset and terminates into an idle gain reduction amplifier. Also included is a PFI history of design evaluation under the two tube, two transducer concept. This also shows PFI in 1962 already had developed and sold a version of the Model D headset or MS 51. Since officially PFI isn't really supposed to be privy to the Model D, Bell should be able to draw a conclusion that they are infringing on our patent.

6663.3  
EP0846 continued.

1170



CONFIDENTIAL

The object of submitting this proposal to Mr. Schiavoni as it by protocol should be, but routing it through a top policy making individual within AT&T is to provide AT&T with all the opportunity to reach a position consistent with the best interests of PFI and the Bell System jointly on this matter and not to embarrass Mr. Schiavoni, who could only at this point side against us.

V. Appraisal of PFI Position by Knowledgeable Ranking Bell System Employee

All of the implications of this memo were carefully outlined to a Bell System gentleman who is totally conversant with this headset, its history and its relation to AT&T. The proposal was also read and criticized for proper content. These are my renderings of his feelings on the entire subject.

He felt we had an extremely strong case that the Bell System would have to consider at a very high policy level. He felt that Mr. Schiavoni would not be at all very sympathetic to our cause at all and neither would Bell Labs. He felt that even a shroud of evidence that we have even marginal patent coverage would have to be considered by AT&T. He felt that the moral position of AT&T appropriating design concepts of a small company, and in the process essentially putting them out of business, would also have to be strongly considered. He stated that the Bell System had already lost suits where the case had not one-tenth the merit of our. He felt that the fact that Plantronics' stock had gone from \$2.50 to over \$40.00 a share, essentially based on Bell System acceptance of the product, coupled with the fact of some 1,000 PFI stockholders, would also have to be considered with the knowledge that the impact of the Model D headset would probably drive Plantronics' stock right off the map. He also felt that the current Bell System program had enough inertia and NIH emotional input with respect to the Plantronics' headset that it would likely take a policy decision within the very top of AT&T to turn this planning from its current direction. Additionally, he felt that it was not to the Bell Systems best interest to proceed in their current plan relative to Plantronics.

VI. Possible Bell System Liabilities in this Issue

- A. Moral issue and public image of AT&T appropriating design concepts of a small company and eliminating the company's market. This image factor must have some dollar value to the Bell System. PFI headsets are well known and understood by a rather large public segment via Bell, UAL, PAA, and the space sheroes. A fairly sophisticated segment of the financial community is also aware of PFI and its relationship to the Bell System. The effect of a suit would not help the system image.

continued.

6663.2  
EP 0845

1171

CONFIDENTIAL

- B. Possible dollar liability of a patent infringement judgment being rendered against them in the event of actual litigation. With all the factors at hand, how will they fare in a California court with an infringement suit. A dollar estimate and a probability factor would have to be placed on this.
- C. To the degree that PFI is restrained from participating in its developed market, there may be room for anti-trust considerations. A dollar estimate of liability must be placed on this item by the system.
- D. The general area of current FCC and government investigation of AT&T rates and practices would become involved here also. The "Toll headset case" would become a documented weapon in the FCC probe, I'm sure.
- E. Finally, the Bell System would lose a quality supplier of a fine product.

VII. Solutions in order of acceptability to PFI.

- 1. The development and production by PFI of a unit as conceptually illustrated in attendant illustrations 1A and 1B, with attached unit description, see Attachment I. Covered by Patent 3,134,556, see Attachment II.
- 2. Or, the refinement and production of the MS 51/T56, see Attachment III with accompanying Photographs 1D and 1E, (earmold mounted unit with idle gain reduction amplifier), covered by Patent 3,134,556.
- 3. Or, the production by PFI of Bell Labs preferential designs utilizing these patented concepts.
- 4. Agreement to separate the lease market from the Bell System internal market, with Bell System supplying its internal operators, and with PFI maintaining agreed rights to the lease market with the following provisions:
  - a) That this agreement be public
  - b) That the Bell System KS a PFI earmold headset with idle gain amplifier for lease customer use in addition to MS 50
  - c) That PFI have exclusive rights to manufacture Model D headset for all other customers outside Bell System.

6663.1  
EP 0844

continued.

1172

CONFIDENTIAL

5. A royalty agreement on all headsets of Model D design made by WECO to PFI on an agreed percentage but in no case less than \$750,000 per annum for three years, with PFI having exclusive right of manufacture for all customers other than WECO.

VIII. PFI Last Course of Action

By policy, practice and philosophy, PFI in its approach to the Bell System has postured itself as a quality on time co-operative supplier. Every effort is directed toward maintaining this image and spirit. Current Bell plans on Model D would be almost totally destructive of this Company, if carried out as contemplated. If all reasonable efforts to request an assured clearly stated policy in a direction to the better interests of PFI, this Company would be forced to use every means to re-direct Bell System planning implied under Section VI. Patent litigation, public relation pressure, and governmental pressure if available, would probably result. This is emphatically not the type of action PFI would relish. Our reputation is built on supplying a quality customer with a quality product.

C. P. Graham  
President

CFG:jps

6663  
EP 0843

1173



MINISTÈRE DE L'INDUSTRIE

SERVICE

de la PROPRIÉTÉ INDUSTRIELLE

## BREVET D'INVENTION

P.V. n° 977.207

N° 1.397.803

Classification internationale :

H 04 m

Casque de télécommunication perfectionné.

Société dite : AIRMED LIMITED résidant en Grande-Bretagne.

Demandé le 5 juin 1964, à 14<sup>h</sup> 29<sup>m</sup>, à Paris.

Délivré par arrêté du 22 mars 1965.

(Bulletin officiel de la Propriété industrielle, n° 18 de 1965.)

(Demande de brevet déposée en Grande-Bretagne le 7 juin 1963, sous le n° 22.906/1963, au nom de la demanderesse.)

La présente invention est relative aux casques de télécommunication et a principalement pour objet un dispositif de fixation perfectionné d'un microphone pour casque de télécommunication, qui est léger, simple et confortable pour l'utilisateur.

Selon l'invention, un dispositif de fixation de microphone pour casque de télécommunication comprend un tube acoustique agencé pour porter le son depuis un point situé au voisinage de la bouche de l'utilisateur jusqu'à un microphone de téléphonie porté par le casque sur l'un de ses côtés latéraux, ledit tube acoustique étant fixé au casque au moyen d'un joint à rotule qui est d'un type adapté pour ne pas présenter de pertes soniques, à travers lequel le tube acoustique communique avec le microphone, et qui permet au tube d'être écarté par oscillation de la bouche de l'utilisateur lorsque son usage n'est pas nécessaire. Un tel tube acoustique peut être notablement plus léger que les microphones habituels et, de façon générale, est plus commode et confortable.

Suivant une autre caractéristique de l'invention, un microphone miniaturisé, ayant une gamme de fréquences effective suffisante pour permettre de transmettre clairement la parole, est combiné avec un tube acoustique ayant une résonance qui tend à compenser une perte de réponse du microphone que l'on a constatée être généralement comprise entre 1 000 et 3 000 cycles par seconde.

D'autres caractéristiques de l'invention apparaîtront au cours de la description qui va suivre, faite en se référant au dessin annexé sur lequel :

La figure 1 est une vue en perspective d'un casque comportant un dispositif de fixation selon l'invention;

La figure 2 est une vue partielle, en coupe, à plus grande échelle montrant la construction d'un tampon qui contient des appareils de téléphonie faisant partie du casque;

La figure 3 est une vue partielle en perspective,

également à plus grande échelle, montrant la construction de l'extrémité côté embouchure du dispositif de fixation du microphone;

La figure 4 est une vue analogue à celle de la figure 2 montrant la substitution d'un bras de microphone à un dispositif à tube acoustique.

Le casque représenté au dessin comporte deux tampons 1 et 2 constitués chacun par un boîtier plat en une matière plastique résistante et légère et comportant un fond 3 et un couvercle 4 fixé au fond au moyen de vis ou autres moyens de fixation appropriés. Les deux tampons 1 et 2 sont fixés aux extrémités opposées d'une bande serre-tête 5 constituée par deux fils métalliques élastiques isolés individuellement et disposés côte à côte dans une gaine 6 en une matière plastique flexible. Les deux extrémités de la bande serre-tête sont fixées aux fonds des tampons 1 et 2 de façon telle que les extrémités de la gaine flexible 6 en matière plastique prennent appui contre les extrémités de deux pattes 7 faisant saillie depuis les extrémités arrière des fonds 3. Les extrémités des fils métalliques élastiques (dont l'une peut être vue en 8 à la fig. 2) dépassent un peu les extrémités de la gaine et traversent complètement les pattes 7 de sorte que les extrémités de ces fils font saillie sur une faible longueur à l'intérieur des tampons 1 et 2. Les pattes 7 sont venues de matière avec les fonds 3 et les fils métalliques élastiques sont fixés solidement dans ces pattes au moyen d'une colle.

La bande serre-tête 5 passe autour de la partie arrière de la tête de l'utilisateur représenté à la figure 2 et a une forme telle qu'elle est adaptée pour maintenir les tampons 1 et 2 appuyés fermement contre les tempes de ce dernier en des points situés au-dessus et un peu en avant des oreilles. Dans ce but, la bande serre-tête a une longueur telle qu'elle peut passer autour de la partie arrière la tête de l'utilisateur en conservant les tampons dans les positions nécessaires. De plus, cette bande

65 2191 0 73 319 3 &lt;

Prix du fascicule : 2 francs

CHOCOLAT DÉPOSÉ

11/7/73

210

1174

a la forme d'un C, de sorte qu'elle doit être ouverte élastiquement pour recevoir la tête de l'utilisateur. Les tampons 1 et 2 sont fixés aux extrémités de la bande serre-tête de telle sorte, et avec les surfaces de leur fond tournées vers l'intérieur comme représenté, qu'elles sont maintenues fermement appuyées contre les tempes de l'utilisateur par l'élasticité inhérente de la bande. Une mince couche d'une matière douce est fixée sur chacun des fonds 3 afin de rendre plus confortable la pression exercée par les tampons 1 et 2 et pour augmenter l'adhérence par frottement des tampons sur les tempes de l'utilisateur. On a constaté qu'il était avantageux de donner à la surface interne des fonds 3 une forme légèrement concave dans le sens de leur longueur comme représenté aux figures 2 et 4.

Chacun des tampons 1 et 2 renferme un écouteur téléphonique 9 du type constitué par une petite capsule ayant un orifice de sortie du son s'étendant à travers un raccord 10 ajusté dans l'évidement d'un bossage 11 prévu pour le recevoir dans le couvercle 4, de façon à constituer un joint acoustique. Un tube acoustique externe 12 conçu pour transmettre le son depuis l'écouteur 9 jusqu'à un cornet acoustique 13 est fixé au bossage 11 par un joint à rotule universel constitué par une rotule 14 logée entre le raccord 10 et un siège sphérique 15 prévu pour cette rotule dans le bossage 11 de raccordement. Le tube acoustique 12 est de préférence en métal et la rotule 14 est en matière plastique. Cette rotule est fixée à l'extrémité du tube 12 et doit bien entendu être percée d'un trou afin de permettre au son provenant de l'écouteur 9 de traverser la rotule et de parvenir dans le tube acoustique. Le tube 12 a la forme représentée afin de soutenir le cornet acoustique 13 à proximité de l'oreille et dans une position appropriée pour transmettre le son à l'oreille.

Les deux fils métalliques élastiques de la bande serre-tête 5 sont utilisés pour relier les deux écouteurs téléphoniques 9 électriquement en parallèle, des bornes étant prévues sur ces écouteurs. Ces bornes sont constituées par des bagues de contact qui sont poussées par-dessus les extrémités en saillie des fils métalliques élastiques lorsque les écouteurs 9 sont montés dans les tampons 1 et 2. Les liaisons nécessaires avec le circuit téléphonique externe sont réalisées au moyen de fils de liaison appropriés faisant partie d'un câble 16 qui pénètre à l'intérieur du tampon 2 à travers le couvercle 4 de celui-ci.

Bien que les tampons 1 et 2 soient maintenus fermement en place par la bande serre-tête arrière 5 sans support supplémentaire, il est parfois souhaitable qu'une bande serre-tête supplémentaire passe par-dessus le sommet de la tête afin que le dispositif paraisse plus sûr à l'utilisateur. Le mode de réalisation représenté au dessin comporte une bande serre-tête supplémentaire de ce type, consti-

tuée par une certaine longueur d'un tube 17 en une matière plastique flexible dont les deux extrémités s'emboîtent télescopiquement sur des tiges 18 fixées sur des manchons montés sur les pattes 7, comme représenté. La bande serre-tête supplémentaire ainsi constituée est très légère et simple et peut être facilement réglée en longueur, en poussant plus ou moins le tube 17 sur les tiges 18. Ces tiges ont des extrémités 19 un peu élargies qui coopèrent avec des bagues 20 fixées aux extrémités du tube 17 pour empêcher celui-ci de se détacher complètement des tiges.

Le casque comporte un dispositif de fixation d'un microphone, qui comprend un tube acoustique 22 agencé pour porter le son depuis un point proche de la bouche de l'utilisateur jusqu'à un microphone téléphonique 21 disposé à l'intérieur du tampon 2 comme représenté à la figure 2. Le tube acoustique 22 est fixé au tampon 2 par un joint acoustique à rotule par l'intermédiaire duquel le tube communie avec le microphone 21, et qui permet au tube acoustique d'osciller de haut en bas afin de pouvoir régler l'embouchure du tube dans une position quelconque désirée à proximité de la bouche de l'utilisateur, ou de pousser cette embouchure pour dégager la bouche de l'utilisateur. Le joint à rotule comporte une pièce de raccord 23 fixée au tube 22 et ayant une collerette pour réaliser un contact à frottement avec un siège prévu pour cette collerette dans la face interne du couvercle 4 du tampon 2. Dans le mode de réalisation représenté, le microphone 21 comporte un raccord 24 qui coopère avec une bague d'étanchéité 25 en polytétrafluoroéthylène, « Nylon », ou autre matière et permet de réaliser un joint étanche au fluide et fournit également un frottement suffisant pour maintenir le tube 22 dans sa position ajustée. La bague d'étanchéité 25 est emmanchée à force dans la pièce 23 et le tube acoustique 22 est introduit dans cette pièce à travers un trou latéral. La pièce de raccordement 23 est engagée dans le trou du couvercle 4 du tampon 2 depuis l'intérieur et sa collerette est adaptée pour s'engager entre la capsule 21 et le couvercle 4.

Cette pièce 23 est ainsi maintenue en place par la capsule. Elle peut ainsi dans son ensemble tourner autour de l'axe de la capsule et assure toujours une communication sans pertes avec la capsule par l'intermédiaire du raccord 24.

Le microphone 21 est un microphone miniaturisé ayant une gamme de fréquences effective suffisante pour transmettre clairement la parole. La caractéristique de réponse de fréquence de tels microphones présente habituellement deux pointes de résonance à des fréquences d'environ 1 250 et 3 250 cycles par seconde avec une chute entre ces pointes. Le tube acoustique 22 est conçu pour compenser cette chute et ainsi améliorer les caractéristiques

1175



générales du dispositif de fixation du microphone. La longueur du tube 22 est déterminée de telle sorte que le tube présente une fréquence de résonance d'onde stationnaire de par exemple 2 250 cycles par seconde afin de compenser la chute précitée. On a constaté qu'un tube 22 complètement ouvert d'une longueur appropriée tend à introduire une troisième pointe dans la réponse totale à la fréquence de résonance d'onde stationnaire. Pour éviter ceci et pour obtenir un niveau de réponse approximatif entre deux pointes de résonance du microphone, une résistance acoustique 29 est intercalée dans l'embouchure du tube 22. La matière utilisée pour cette résistance acoustique peut être de la soie pure ou peut être un tampon d'une matière telle que de la laine, mais il est préférable d'utiliser un bouchon en une matière frittée, de forme cylindrique, qui est emmanchée à force dans le tube 22.

Afin que l'ensemble du dispositif soit aussi léger que possible, le tube 22 a un petit diamètre par rapport à celui des tubes acoustiques habituellement utilisés dans les dispositifs d'écoute. Afin de permettre au tube de capter une plage relativement étendue du champ sonore, un collecteur de sons constitué par un cornet acoustique 28 est emmanché sur l'embouchure du tube. Ce cornet est de préférence en caoutchouc ou autre matière plastique analogue à du caoutchouc.

La matière dont est fait le tube 22 doit être suffisamment rigide pour l'empêcher de capter des bruits externes ou indésirables à travers sa paroi.

On peut prévoir le dispositif de façon à pouvoir remplacer le tube acoustique par un bras portant un microphone si on le désire. Dans ce but, le microphone peut être fixé à l'une des extrémités d'un bras tubulaire 22 analogue au tube acoustique 22 représenté aux figures 1, 2 et 3, mais contenant les conducteurs 27 du microphone. Le bras tubulaire est fixé sur une pièce 23 ayant une collerette, analogue à celle représentée aux figures 1 à 3 et est ainsi adapté pour être fixé au tampon 22 à la place du tube acoustique. Il est maintenu en place par un organe d'écartement 26 compressible élastique et tubulaire, maintenu comprimé entre le bossage 23 et le fond 3 du tampon 2 comme représenté à la figure 4. Dans une variante, un ressort de compression peut être utilisé à la place de l'organe d'écartement 26. Les conducteurs 27 du microphone passent à travers le bras 22, à l'intérieur du tampon 2 à travers l'organe 26 et passent par une entrée de câble prévue dans le couvercle 4, comme représenté.

Bien entendu, l'invention n'est pas limitée aux modes de réalisation représentés et décrits qui n'ont été choisis qu'à titre d'exemples.

#### RÉSUMÉ

L'invention a pour objets :

I. Un dispositif de fixation de microphone pour casque de télécommunication, remarquable notamment par les caractéristiques suivantes considérées séparément ou en combinaisons :

1° Il comprend un tube acoustique agencé pour porter le son depuis un point situé au voisinage de la bouche de l'utilisateur jusqu'à un microphone de téléphonie porté par le casque sur l'un de ses côtés latéraux, ledit tube acoustique étant fixé au casque au moyen d'un joint à rotule qui est d'un type adapté pour ne pas présenter de pertes soniques, à travers lequel le tube acoustique communique avec le microphone et qui permet au tube d'être écarté par oscillation de la bouche de l'utilisateur lorsque son usage n'est pas nécessaire;

2° Le microphone est un microphone miniaturisé ayant une gamme de fréquences effective suffisante pour transmettre clairement la parole et le tube acoustique a une résonance tendant à compenser une chute de la caractéristique de la réponse de fréquence du microphone;

3° Une résistance acoustique est disposée dans l'embouchure du tube acoustique;

4° Le tube acoustique se termine à son embouchure par un cornet acoustique ou autre dispositif collecteur de sons;

5° Le tube acoustique est fixé à un boîtier faisant partie du casque et renfermant le microphone, au moyen d'une pièce de raccordement montée de façon à pouvoir tourner librement dans un trou de la paroi du boîtier et comportant un rebord en contact de frottement avec un siège prévu pour lui dans la surface interne de la paroi du boîtier;

6° Un joint acoustique étanche entre le tube acoustique et le microphone est constitué par la coopération d'un raccord prévu sur le microphone avec une bague d'étanchéité qui est elle-même étroitement ajustée dans la pièce de raccordement;

II. Un casque de télécommunication remarquable notamment en ce qu'il comporte un dispositif de fixation de microphone tel que défini sous I.

Société dite : AIRMED LIMITED

Par procuration :

Cabinet LAVOIX



Fig. 1.

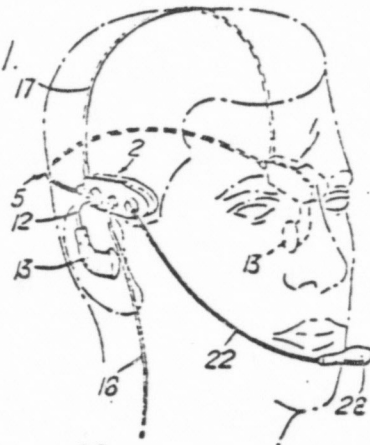


Fig. 2.

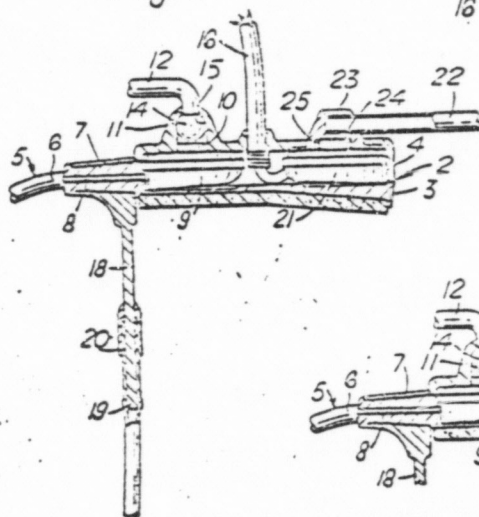


Fig. 4.

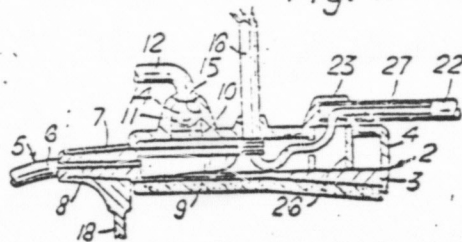
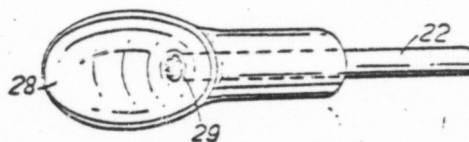


Fig. 3.



477

December 2, 1965

Mr. J. C. Chagnard  
P. O. Box 406  
Palo Alto, California

Dear Mr. Chagnard:

As per our recent telephone conversation, I am enclosing the following information for your perusal relative to the Alimad Limited patent that was filed in France -- June 5, 1964:

1. Mr. S. C. Bentley's letter 12 Nov., 1965 suggesting that Dr. Brent of Stevens, Langner, Parry & Robinson be allowed to represent us.
  2. One copy of the French Patent.
  3. One copy of our Patent.
  4. Two additional patents filed on "acoustic type" devices, which may be of interest.
  5. Copies of early clippings describing our product.
  6. Early photos of our product.
- Note: Please retain the photos and return them to me when you are finished with them, as I wish to return them to our historical file for future reference.

I am sending Mr. S. C. Bentley a copy of this letter, and advising him that he will hear from us, once you have had an opportunity to review the situation and advise Plantronics as to future action. Because of the sensitive nature of this situation, I trust that you will expedite whatever suggestions you may have. Thank you for your attention to this matter.

Sincerely yours,

PACIFIC PLANTRONICS, INC.

cc: S. C. Bentley

S. G. Spragens  
Director of Marketing

EP

6916  
007551

CHAGNARD DEPT. EX #9  
11/18/73  
VCC

1178

IN THE UNITED STATES DISTRICT COURT  
FOR THE SOUTHERN DISTRICT OF NEW YORK

-----x  
PLANTRONICS, INC., :  
Plaintiff, : CIVIL ACTION  
v. : NO. 72 CIV. 1625  
ROANWELL CORPORATION, : JUDGE CONNER  
Defendant. :  
-----x

RESPONSES TO WRITTEN QUESTIONS  
BY JEAN C. CHOIGNARD

1. Why, and at whose request, did you make an investigation to determine whether any statutory bar existed which would prevent the filing of valid foreign patent applications corresponding to Larkin U. S. patent 3,184,556? Describe the circumstances surrounding the request, the information supplied to you and the investigation you undertook. Also, state when the request was made, and when, and for how long, the investigation took place.

Answer: While U. S. Patent 3,184,556 was still pending in the U. S. Patent Office, but more than one year after its filing date, I had a conversation with someone at Plantronics (I am almost certain it was Keith Larkin) who asked me whether corresponding patent applications could be filed in foreign countries, particularly Great Britain. The question arose because Plantronics was in the process of setting up a distributor or representative in Great Britain, and that distributor or representative had requested that such a patent application be filed in Great Britain. I did not make an investigation as such,

4179



I knew that Plantronics' headsets had been described in technical magazines of wide distribution that would have reached Great Britain.

2. (a) Did you advise Mr. Keith Larkin, or anyone else representing Plantronics, Inc.\*, as to the existence or effect of any statutory bar or other legal impediment to the filing of foreign patent applications corresponding to Larkin U. S. patent 3,184,556?

Answer: I told the person I believe to be Keith Larkin that it was too late to file a corresponding patent application in Great Britain.

2. (b) Did you give such advice specifically as to England or Great Britain?

Answer: Yes.

3. If the answer to the preceding paragraph 2 is affirmative in any part, state, in each case of rendering such advice, what advice you gave, when it was given, to whom it was given (naming each person to whom it was given), and the manner in which it was given. If orally, describe the circumstances; if in writing, describe all of the relevant documents as best you can recall.

Answer: Same as above. To the best of my recollection the advice was given on the telephone.

---

\* Plantronics, Inc. shall be understood to include Pacific Plantronics, Inc. and any other predecessor company.

1180

4. Did you know that a foreign application corresponding to Larkin U. S. patent 3,184,556 was filed in Great Britain (which ultimately became British patent 1,009,818, a copy of which is being supplied)? If so, state when you first learned of this. Also, state all of the facts known to you concerning the filing of this British patent application and the securing of this British patent.

Answer: My recollection is hazy but I am under the impression that I learned later that a patent application corresponding to U. S. Patent 3,184,556 was filed in Great Britain. I do not know when I learned of this nor do I know any facts concerning the filing of this British application other than what I have stated above.

5. To your knowledge, were any other foreign patent applications filed (including foreign utility model applications and petty patent applications) which corresponded in whole or part to Larkin U. S. patent 3,184,556? If so, identify each such foreign application and state all of the facts known to you concerning each such foreign application.

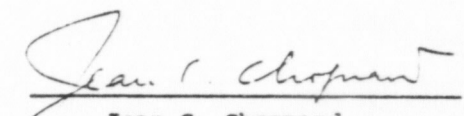
Answer: I do not remember whether any other foreign patent applications were filed corresponding in whole or in part to Larkin U. S. Patent 3,184,556.

6. If the answer to paragraph 2 hereof is affirmative in any part, state, in each case of rendering such advice, whether it was given before or after the August 25, 1964 filing date of British patent 1,009,818, and whether it was given before or after this British patent was published on November 10, 1965.

Answer: Not applicable.

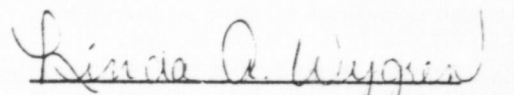
7. If you know, state whose decision it was to file the British patent application which became British patent 1,009,818. Also, state all facts known to you concerning this decision.

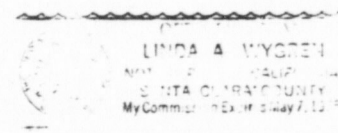
Answer: I do not know whose decision it was to file the British patent application which became British Patent 1,009,818, except that I am under the impression that the British distributor or representative was quite insistent that this be done.

  
Jean C. Chognard  
Deponent

State of California )  
County of Santa Clara ) ss.

Subscribed and sworn to before me this 1st day of November, 1974.

  
Notary Public  
In And For The County Of  
Santa Clara, State Of California

  
(Notary's Seal)



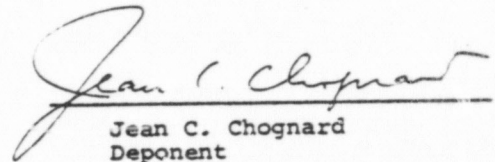
IN THE UNITED STATES DISTRICT COURT  
FOR THE SOUTHERN DISTRICT OF NEW YORK

-----X  
PLANTRONICS, INC., :  
Plaintiff, : CIVIL ACTION  
 : NO. 72 CIV. 1625  
v. :  
ROANWELL CORPORATION, : JUDGE CONNER  
Defendant. :  
-----X

FURTHER RESPONSE BY JEAN C. CHOIGNARD  
TO WRITTEN QUESTION NO. 6

6. If the answer to paragraph 2 hereof is affirmative in any part, state, in each case of rendering such advice, whether it was given before or after the August 25, 1964 filing date of British patent 1,009,818, and whether it was given before or after this British patent was published on November 10, 1965.

Answer: When I gave this advice I had before me a recent letter from Plantronics' proposed distributor or representative in Great Britain, and that letter contained a request that a patent application corresponding to U. S. Patent 3,184,556 be filed in Great Britain. Although I have no present recollection of the date I gave this advice, it was soon after the receipt of that letter by Plantronics.

  
Jean C. Chognard  
Deponent

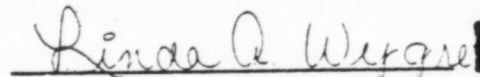
State of California )  
County of Santa Clara) ss.

Subscribed and sworn to before me this 7th day of  
November, 1974.



LINDA A. WYGREN  
NOTARY PUBLIC - CALIFORNIA  
SANTA CLARA COUNTY  
My Commission Expires May 7, 1975

1501 Page Mill Rd., Palo Alto, Calif. 94304  
(Notary's Seal)

  
Notary Public  
In And For The County Of  
Santa Clara, State Of California

1183

DEFENDANT'S SUMMARY OF THE DEPOSITION OF  
JEAN C. CHOIGNARD TAKEN NOVEMBER 8, 1973

Mr. Chognard, a patent attorney whose deposition was taken by the defendant, testified that he represented the plaintiff in connection with the application of the Larkin patent in suit, from about September of 1962 to some time after the application was allowed in 1965. (pp. 3, 27)

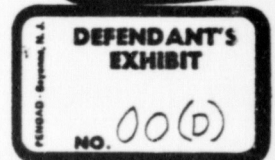
Chognard's principal contact at Plantronics was Keith Larkin, although he did write to Courtney Graham when Larkin resigned as president. (p. 4)

He testified that he did not look into the question of whether the correct inventor had been named (p. 5), that he had several discussions with Larkin as to what Larkin considered his invention to be, and they finally zeroed in on the provision of two tubes, a voice tube 26 and ear tube 29, from a little block containing the electronics. (p. 6)

After receiving the first Patent Office Action issued in the Larkin patent application, which was dated June 11, 1963, he reviewed the cited references which included Dreher et al patent 2,904,640 and Olney et al patent 2,485,405. (pp. 7-8) He recalled that the Dreher device included a single voice tube 21 which had a little funnel-shaped thing at the far end and an ear piece. (pp. 7, 10, 12)

He stated that the Olney patent appears to show an earmuff headset with an acoustic voice tube having two separate passages, but he would have to read the patent to know if the two voice tubes are for noise cancellation. (pp. 9, 11, 12) He recalls the Dreher reference very well because it was smaller than the other references, and because he thought it was the most pertinent (p. 20), but he was not terribly impressed by the Olney patent because it showed a rather bulky device. (p. 13)

After studying the cited references, Chognard discussed with Larkin the matter of hiring an acoustic expert, and then contacted an acoustical man at Stanford Research Institute, whose name he could not recall. (pp. 5, 7, 8, 12) He asked the SRI man whether there was some relationship between the acoustical phenomena in the Larkin device, such as a quarter-wave phenomenon or something, that was different from what had been done before -- and the SRI man did not come up with anything, so they went back to the comfort aspect. (pp. 13-14)





Chognard stated that he then amended the claims of the Larkin application, in December of 1963, so they recited two tubes, i.e. a voice tube and an ear tube, in order to distinguish over the references. (pp. 5, 15) He believes that he discussed the inclusion of an ear tube in the Larkin claims with either Larkin or Graham, but he has no recollection of what was discussed, and he does not know whether they agreed to the amendment or understood that all of the claims were so limited. (p. 15)

Chognard stated that he had no background in headsets (p. 17), and has no recollection of the 1962 Larkin-Dennis paper or of reading a passage in it which states that the Larkin headset used a standard ear piece to carry sound from the receiver unit to the ear. (p. 18) Nor does he recall the Plane-Aids flyer, Telex sales literature or ARINC characteristic. (pp. 18-19) Also, he stated that neither Larkin nor anyone else at Plantronics ever indicated to him that they knew of such a publication showing an ear tube in a headset. (p. 20)

Chognard also stated that he does not recall that Larkin ever told him that the outstanding and central feature of his headset was the acoustical voice tube, and that the ear tube was simply a standard ear piece, as stated in the Larkin-Dennis paper. (p. 20)

When asked whether the Dreher patent has two tubes, Chognard stated that there is a canal extension in the earmold through which sound travels but from the outside it does not look like a tube. (p. 21) When his attention was called to the phrase "pipe-like extension" in the Dreher patent, he testified that the extension that is pipe-like looks a little bit like a tube, yes. (pp. 21-2) Chognard testified that the difference between Dreher and Larkin which struck him was that Dreher used something that fits into the ear, probably a custom-made piece, while the ear piece in Larkin is just a piece of spaghetti. (p. 22) Also, there are two transducers in Larkin and one in Dreher. (p. 23)

Both the Roanwell R-61 and the Plantronics MS-51 are headsets which have an earmold which fits in the ear of the wearer. Chognard testified that acoustically it is probably correct that these headsets have two tubes, a voice tube and an ear tube, and this is also true of the Dreher headset. (pp. 24-5, 27)

Chognard had discussions with Larkin about filing foreign applications corresponding to the Larkin U.S. application, possibly in Canada or England. (p. 28) He testified



that Larkin was having negotiations at the time with somebody in England (pp. 28, 30) and he, Chognard, investigated to see whether any statutory bar existed which would prevent the filing of valid patent applications in foreign countries. He recalls that he did find a bar. (p. 29) He inquired as to Plantronics' magazine advertisements in journals which had international distribution, and believes that he found such publications, and he probably asked whether any Plantronics brochures or sales literature had been sent to England, but he does not recall specifically asking anyone at Plantronics whether there had been any sales in England. Also, he recalls giving Larkin advice on the subject of filing, but he did not handle the filing. (p. 31)

Chognard has no recollection of the circumstances surrounding an Airmed French patent 1,397,803 and Plantronics' possible infringement of it (pp. 31-4), but he was aware of the Bowman suit against Plantronics, and he probably discussed with Larkin ways of conceivably settling the matter. (p. 35)

DEFENDANT'S SUMMARY OF RESPONSES TO WRITTEN QUESTIONS BY  
JEAN C. CHOIGNARD, FILED NOV. 6 & 11, 1974

Mr. Chognard testified, in response to defendant's written questions, that while the application for the Larkin patent in suit was still pending before the U.S. Patent Office, but more than a year after it had been filed, he had a conversation with someone at Plantronics, who he is almost certain was Keith Larkin, who asked him whether corresponding patent applications could be filed in foreign countries, particularly Great Britain. (Q. 1)

At the time, according to Chognard, Plantronics was in the process of setting up a distributor or representative in Great Britain who requested that a British patent application be filed. Chognard did not make an investigation as such; he knew that Plantronics headsets had been described in technical journals of wide distribution which would have reached Great Britain. (Q. 1) He thus advised the person he believes to have been Keith Larkin, by telephone, to the best of his recollection, that it was too late to file a corresponding patent application in Great Britain. He stated that when he gave this advice he had before him a recent letter from the proposed distributor or representative in Great Britain, which requested that the British patent application be filed, and, although he has no present recollection of the date he gave the advice, it was soon after the receipt of that letter by Plantronics. (Q. 6 supp.)

Chognard also testified that his recollection is hazy as to when he first learned that a Larkin British patent application had been filed, but he is under the impression that he later learned of this. He does not, however, know any facts concerning the filing, other than those he stated above. (Q. 4) He does not remember whether any other corresponding foreign patent applications were filed, and he does not know whose decision it was to file the British application, except that he is under the impression that the British distributor or representative was quite insistent that it be filed. (Q. 5, 7)

DEFENDANT'S SUMMARY OF PORTIONS\* OF DEPOSITION OF  
G. VICTOR RODGERS TAKEN APRIL 29, 1974

Mr. G. Victor Rodgers, whose deposition was taken by the plaintiff on written questions, with cross questions by the defendant, testified that after graduation from college with an electrical engineering degree he worked as an engineer for Bendix Radio for five years, and then twelve years as a senior engineer for the Navy, developing and evaluating various types of electronic equipment, and then thirteen years for the Federal Aviation Administration (FAA), first as a development engineer, then as a section chief, and since 1963 as a branch chief. (p. 3-4)

His employment at the FAA has been concerned with the development and evaluation of all types of communication equipment, first as an individual worker, and later in a supervisory capacity. (pp. 4, 34) He testified that he is the author of a report concerning the plaintiff's MS-50 headset, and including the results of comparison tests with two other headsets, the report being entitled "Development of Lightweight Headset" by G.V. Rodgers, dated February 1963, this report first being distributed in 1963 and since then on a request basis. (p. 5, 10)

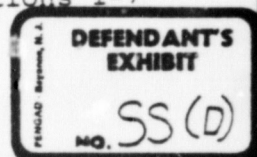
Mr. Rodgers also testified that he was responsible for the development and evaluation of the lightweight headset at the FAA, and in this capacity he wrote the foregoing report. (p. 5) Also, he stated that he took a particular interest in this project because it involved the development of a device that had been needed for a long time, and he personally participated in the operational trials and a large portion of the laboratory tests. (p. 5)

He testified that he has reviewed the report and he finds that it accurately reflects the results of the Government development and study. (p. 5)

On cross-examination, he testified that the Telex headset referred to in the third paragraph of the first page of the report, as being foremost among the commercially available items that appeared promising and had been privately purchased and tried with some favor, was the Telex Twinset headset, Model 3775, which was a receive-only headset -- and in this connection he referred to Gilbert patent 2,586,644. (p. 6) He testified that headsets with boom microphones for transmitting were available, but were not ordered due to their weight. (p. 6)

\* Covers Mr. Rodgers' depositions on plaintiff's questions 1-7 and defendant's questions 1-13 and 34-37.

1188





When asked what the report meant by the statement in the fifth paragraph of the first page that "previously planned in-house development effort was discontinued" when the MS-50 headset was proposed by Plantronics, he testified that "The previously planned in-house development effort was to purchase a number of commercially available items and to study possible modifications of one or more of these devices to make it more suitable for air traffic control use and then to evaluate the resulting devices. Several items were purchased, but the intended modifications were never started since the Plantronics' representatives came in with their proposal at that time." (p. 7)

He also testified that he knew of no other headset, besides the MS-50, which used an acoustic voice tube. (p. 8) He testified further that he was not aware of either the Stromberg Carlson headset shown in Olney et al patent 2,485,405 or the Ohio State University headset shown in Dreher et al patent 2,904,640 (copies of these patents having been supplied by defendant), but that the device described in the Olney et al patent was designed primarily for noise cancellation, and is more elaborate or complicated than the item they were looking for. (p. 9)

Further, he testified that the Oakland trials referred to in the FAA report were conducted for a period of approximately two or three weeks in the Fall of 1962, and that he took an active part in planning the trials and participated during the first week. (p. 16)

1973

LESLIE W. CLARK

IN THE UNITED STATES DISTRICT COURT  
FOR THE SOUTHERN DISTRICT OF NEW YORK

PACIFIC PLANTRONICS, INC.,  
Plaintiff,  
v.  
ROANWELL CORPORATION,  
Defendant.

CIVIL ACTION

NO. 72-CIV. 1625

PLAINTIFF'S RESPONSES TO  
DEFENDANT'S INTERROGATORIES, FIRST SET

Plaintiff responds to Defendant's Interrogatories,  
First Set, as follows with respect to the Larkin patent  
(U.S. patent 3,184,556).

INTERROGATORY NO. 1:

With regard to the alleged invention of each of the  
three patents in suit:

\* \* \*

(g) Identify each additional written description of  
all or any part of each such alleged invention which is dated  
or was prepared prior to the filing date of the patent in suit  
to which it pertains, in each case giving the title and date  
of the document, the person who prepared it, the person for  
whom it was prepared, the purpose for which it was prepared,  
and all persons to whom it was disclosed or sent prior to the  
filing date of the patent in suit to which it pertains.

(h) When was each such alleged invention first dis-  
closed to anyone else other than the patentee of the patent  
in suit to which it pertains?

1190

DEFENDANT'S  
EXHIBIT  
NO. TT



RESPONSE:

(g) No further written descriptions prior to the filing date have been found at this time. However, photographs of actual units built before the filing date are available, and have been produced to Defendant. These are identified as EP 5658 identified at the Leonhardt and Trumbull depositions; and EP 5651.

(h) The complete invention was first disclosed to persons outside Plantronics on September 18, 1961.

\* \* \*

INTERROGATORY NO. 6:

With regard to the alleged inventor of each alleged invention of each patent in suit:

\* \* \*

(f) Identify all articles and all other writings authored or coauthored by each said inventor.

RESPONSE:

(f) Mr. Larkin coauthored, with A. Dennis, an article entitled "Use of Acoustical Tubes to Improve Microphone Performance," which was presented at an SAE meeting in April 1962. It is not known whether Mr. Larkin authored other articles or papers.

\* \* \*

1191



INTERROGATORY NO. 9:

(a) Have any of the alleged inventions of any of the patents in suit been incorporated into any product of plaintiff? If so, identify and describe each such product and state when and where and by whom it was first marketed and the period of time over which it was marketed.

(b) Have any of the devices disclosed in the patents in suit or any improvements or modifications thereof been marketed by plaintiff? If so, supply the same information as requested in subparagraph (a) hereof as to each such product marketed.

RESPONSE:

9. (a) Yes. The invention is incorporated in the MS-50 and MS-80 (StarSet) headsets. The MS-50 was marketed from about September 1961 to date, and the MS-80 was marketed from about February 1969 to date.

(b) Yes. Same as (a).

\* \* \*

INTERROGATORY NO. 35:

(a) When did plaintiff, or any present or past officer or agent or representative of plaintiff, or of any of its predecessors, either while associated with plaintiff or previously, first learn of the following:

- (1) the headset sold by or for Telex under the name "Twinset"?

1192

(b) Set forth the full circumstances attending the first knowledge by the plaintiff, or by any officer or agent or representative of plaintiff, or of any of its predecessors, with respect to each of said items (1), (2) and (3) of subparagraph (a) hereof.

RESPONSE:

35. (a) (1) Approximately September of 1962.

\* \* \*

(b) (1) Telex proposed that Robert Sell of Telex should visit Plantronics, to discuss an "adaptation" of the Twinset. This information was communicated by Courtney Graham to Keith Larkin on September 18, 1962, by telephone. The message is recorded in Mr. Larkin's notebook (G32) which has been produced to Defendant. It is possible that G. Victor Rodgers, of FAA, mentioned or disclosed the Twinset earlier to Plantronics personnel, but this has not been verified.

\* \* \*

PLANTRONICS, INC.,

V. 1

Defendant.

1194



Response:

Admitted, although the project was a joint effort with Audiotone.

4) That the personnel of Plantronics, Inc., were aware in 1972 that the MS-43 headset was in public use at that time.

Response:

Admitted, if the request is correctly understood to refer to 1962, with respect to the MS-43 version shown at EP 4806.

5) That the MS-43 headset was on sale in 1962.

Response:

Admitted with respect to the MS-43 version shown in EP 4806.

7) That the MS-43 headset constitutes prior art to the Hutchings patent No. 3,548,118 and Hutchings Des. 218,173.

Response:

Plaintiff admits that the MS-43 version shown in EP 4806 constitutes prior art in the sense that it was in public use and on sale in 1962.

8) That Wallace Keith Larkin filed a patent application in Great Britain on August 25, 1964, based on the disclosure of his U.S. patent No. 3,184,556.

Response:

Plaintiff admits that the British Larkin application was filed, and that the disclosure thereof substantially corresponds to the disclosure of U.S. patent 3,184,556.

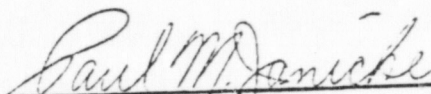
9) That the said British Larkin application was not filed under the International Convention.

10) That publications describing the headset shown in the Larkin British application had reached Great Britain or been published there on or before August 25, 1964.

11) That Plantronics, Inc., had sold headsets embodying the Larkin invention to customers in Great Britain prior to August 25, 1964.

Response:

Requests (9)-(11) are objected to, on the ground that the inquiries relate only to Plaintiff's British patent not here in suit, and not to any issue in the present case. See Carter-Wallace v. United States, 449 F.2d 1374, 1386, 171 U.S.P.Q. 359, 367 (Ct. Cls. 1971).



Paul M. Janicke  
ARNOLD, WHITE & DURKEE  
2100 Transco Tower  
Houston, Texas 77027  
713/621-9100

Robert Neuner  
BRUMBAUGH, GRAVES, DONOHUE  
& RAYMOND  
30 Rockefeller Plaza  
New York, New York 10020  
212/489-3300

Attorneys for Plantronics



IN THE UNITED STATES DISTRICT COURT  
FOR THE SOUTHERN DISTRICT OF NEW YORK

-----X	:	
PLANTRONICS, INC.,	:	
	:	
	:	
Plaintiff:	:	
	:	
v.	:	CIVIL ACTION
	:	72 CIV 1625
	:	JUDGE CONNER
ROANWELL CORPORATION	:	
	:	
Defendant:	:	
	:	
-----X	:	

DEFENDANT'S REQUEST FOR ADMISSIONS

Defendant requests that Plaintiff admit, for the purposes of trial of this cause:

- 1) That the attached publication designated Exhibit A-1 appeared in the April 4, 1964 issue of the magazine Telephony, on page 43, and was available to the public in England from the Reading Room of the British Museum Library and from the British Patent Office Library, both in London, England, on approximately April 30, 1964.
- 2) That the attached publication designated Exhibit A-2 appeared in the May 30, 1964 issue of the magazine Telephony, on page 31, and was available to the public in England from the Reading Room of the British Museum Library and from the British Patent Office Library, both in London, England, on approximately June 24, 1964.
- 3) That the attached publication designated Exhibit B-1 appeared in the March 1963 issue of the magazine

1192



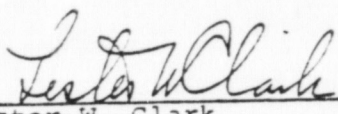
QST (Journal of the American Radio Relay League), on page 141, and was available to the public in England as follows:

- a) Manchester Public Library, Central Library, Manchester, England, in March 1963,
- b) National Physical Laboratory, Teddington, Middlesex, England, in March 1963.

4) That the attached publication designated Exhibit B-2 appeared in the May 1963 issue of the magazine QST (Journal of the American Radio Relay League), on page 87, and was available to the public in England as follows:

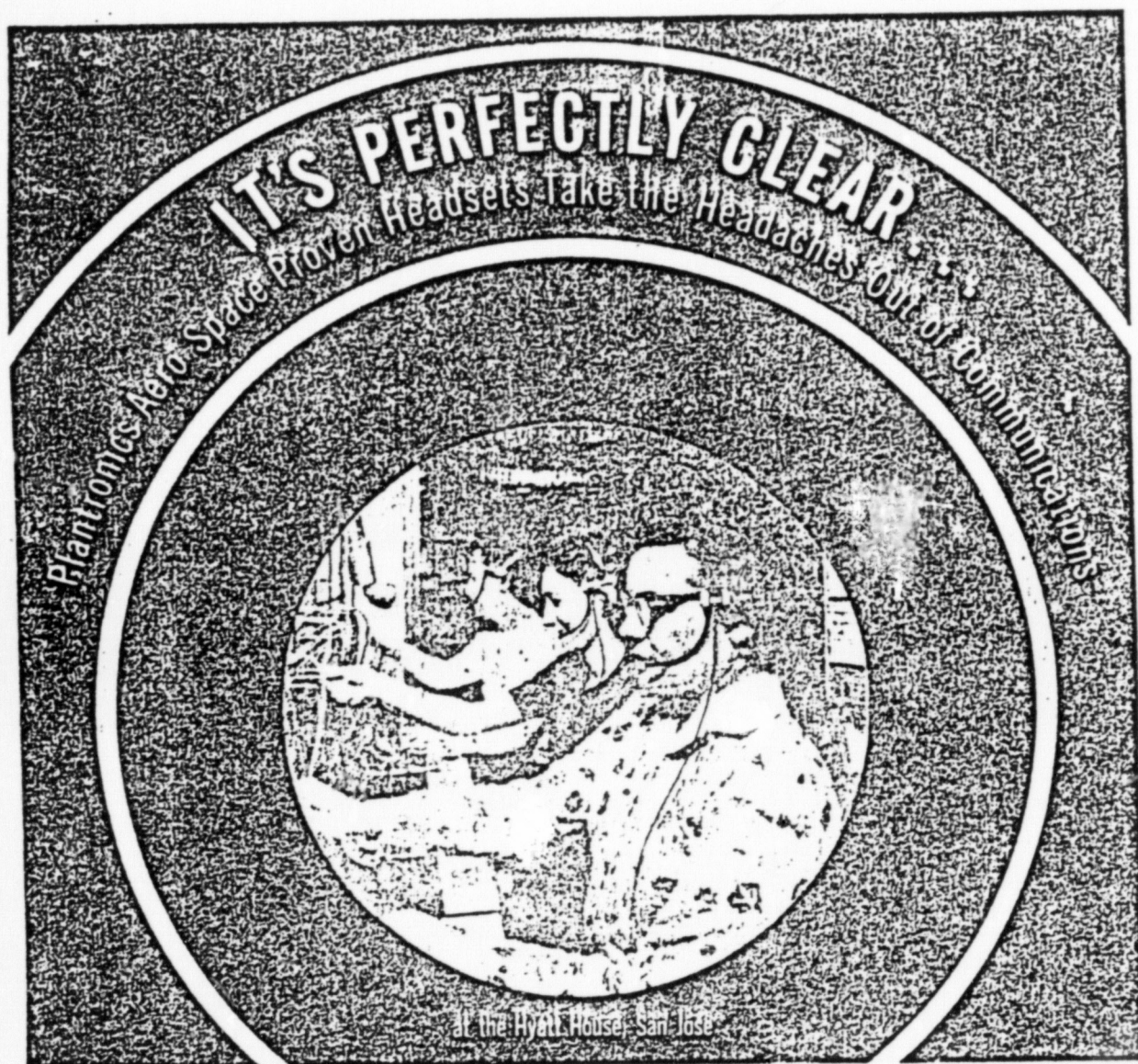
- a) Manchester Public Libraries, Central Library, Manchester, England, on May 23, 1963,
- b) National Physical Laboratory, Teddington, Middlesex, England, on approximately May 13, 1963.

5) That the attached publication designated Exhibit C-1 appeared in the November 1962 issue of the magazine Flying, on page 12, and was available to the public in England from the British Museum Library in London, England, in November 1962.

  
Lester W. Clark  
COOPER, DUNHAM, CLARK, GRIFFIN  
& MORAN  
30 Rockefeller Plaza  
New York, New York 10020  
212/977-9550  
Attorneys for Defendant

August 30, 1974

1198



Pacific Plantronics remarkable MS-30/T-54 Microphone-Receiver looks like, performs like, and IS like no other headset. An adaptation of the rugged, dynamic equipment worn by our earth orbiting astronauts, PPI miniaturized headsets offer so much clarity you need only whisper to be heard. Thanks to PPI's exclusive acoustical transfer tube slurring, sibilants and other transmission distortions, common with ordinary microphones, are a thing of the past.

Plantronics MS-30/T-54 is so light (weighs less than 2 oz.) and so comfortable you're quite apt to forget you're wearing it. It's convenient, too, and

can be worn optionally on either furnished lightweight headband or clipped to the bow of ordinary spectacles or sun glasses.

It's perfectly clear to the more than 5000 switchboard operators and countless others who have switched to the MS-30/T-54 that this headset is the finest available today. Try one yourself. It's all-round superiority will be perfectly clear to you, too.

Plantronics MS-30/T-54 equipment is available in California to customers of Pacific Telephone and Telegraph Company and is distributed by Automatic Electric Company, Northlake, Illinois.



The Hyatt House Hotel, San Jose, Calif., is a customer of Pacific Telephone and Telegraph Company.

**PACIFIC PLANTRONICS, INC.**

Telephone (408) 426-5858

P. O. Box 604 Santa Cruz, California, 94102

APRIL 4, 1964

43

*Telephony*

Exhibit A-1

*1499*



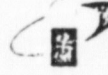


To satisfy your needs for our proven, precision MS-30/T-54 Headsets we have the full support of only the finest distributors

- Boost Switchboard Operator Efficiency
- Clarity: Crisp transmission. Superior reception
- Durability: Stands rough handling. Less maintenance
- Comfort: Lightweight (Full half pound lighter than old type headset)
- Convenience: Headband optional but unnecessary
- Performance: Prototype proven by our orbiting astronauts

For Service Contact Your Distributor  
 Bell System purchasing should be directed to: **Western Electric**  
 Independent telephone company buying should be directed to either:  
**AUTOMATIC ELECTRIC · GraybaR · STROMBERG-CARLSON**

PBX subscribers may order from your telephone company. All inquiries received by Plantronics will be properly channeled thru your distributor organization.

 **PACIFIC PLANTRONICS, INC.** Santa Cruz, California, 95061 phone (408) 426-5858

1AAY 30, 1964

*Telephony*

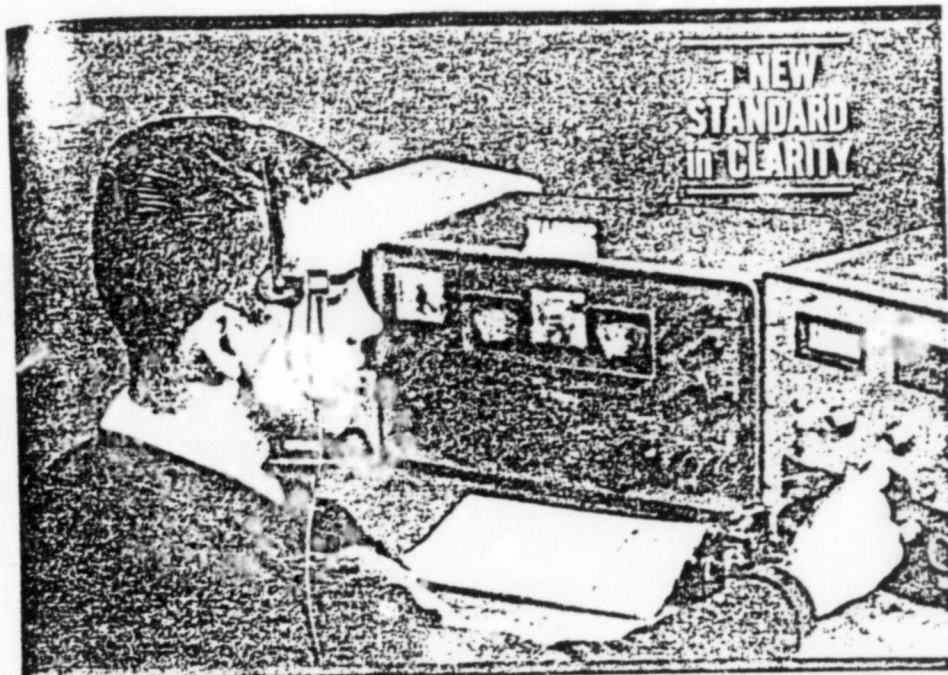
31

Exhibit A-2

*1200*



MARCH 1963 - GST



## PLANTRONICS OFFERS AERO-SPACE DEVELOPED HEADSETS

**CLARITY.** PACIFIC PLANTRONICS, MANUFACTURER AND SUPPLIER OF MICROPHONE EQUIPMENT TO PROJECT MERCURY ASTRONAUTS, provides Radio Operators with the world's finest headsets and a concept of clarity previously unavailable in revolutionary MS-30 Microphone-Receiver and MS-20 (Microphone only) units. With the exclusive Acoustical Transfer Tube™ PPI engineers make it possible to broadcast in a low speaking voice and always be clearly understood. At the same time annoying sibilants and distortions have been eliminated.

**CONVENIENT.** Weighing less than 2 oz., these remarkable headsets are so convenient they can be worn either with furnished headband or can be clipped easily to the bow of ordinary spectacle frames.

**COMFORT.** They're comfortable too. These dynamic microphones are so lightweight, the operator forget he's wearing them. Cumbersome, heavy headsets are a thing of the past.

**AERO-SPACE DURABILITY.** Capable of withstanding forces up to 10,000 instantaneous G's Plantronics' MS-30 and MS-20 equipment is extremely durable as might be expected of precision products created by this proven aero-space leader. Available at Most Dealers.



MS-20 ..... \$32.50  
Microphone only  
MS-30 ..... \$47.00  
Microphone-Receiver

\*Pat. Appl. for

Dealer Inquiries invited

**PACIFIC PLANTRONICS, INC.**  
111 Josephine St., Santa Cruz, California  
Proven Precision Instruments

If not available at your dealers please use coupon below and ORDER TODAY!

☐ Pacific Plantronics, Inc. Dept. F  
Santa Cruz, Cal., P.O. Box 604, CA 6-5858

Gentlemen: Please Air Mail me prepaid

MS-30 Headset Combination @ \$47.00  
MS-20 Microphone only @ \$32.50

I'm enclosing my check for \_\_\_\_\_  
in payment. Please add 4% sales tax to  
all California orders.

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_

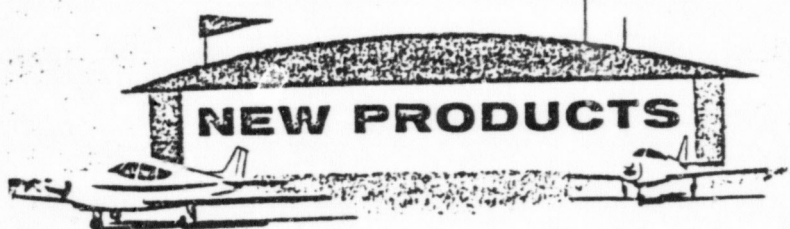
141

Exhibit B-1

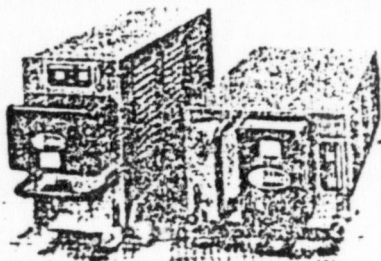
1201





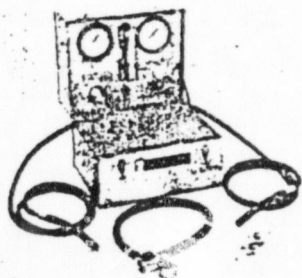


Electronic Devices Corp. of 4212 Ponce de Leon, Coral Gables, Fla., announces two new high-powered, long-range HF transceivers in the 10 and 20-channel categories: the ETR-10 and ETR-10/20. Priced at \$895 including shockmount, the ETR-10 offers 10 full channels with unlimited separation, and frequency



range of 1,800 to 20,000 kcs transmit and receive. The companion ETR-10/20 with same frequency range, 20-channels and with A and B facilities is priced at \$1,045 including shockmount, with crystals and accessories extra. Power requirements are 14 or 28 volts. Measured antenna power is 52 to 56 watts. Both units are available in horizontal mounting (right), 6 1/2 inches overall height, or regular, 9 1/2 inches high.

Zep Aero, El Segundo, California, manufacturer of oxygen equipment and components is marketing two new items—one, a lightweight, portable test console (in photo) developed for use by aircraft serv-



ice facilities for checkout of continuous flow oxygen systems. The second item is a plastic carrying case tailored to accommodate the firm's lightweight one-and-one-half hour Zep-O-Life portable system. Address: 109 Sheldon St., El Segundo.

A streamlined low-drag broad band VHF antenna, selling for \$69.96, is the latest product news from King Radio, Olathe, Kan. Called the KA-21, the new antenna, weight 1 1/2 pounds, is designed to obtain full transmitter power and reception from King's 360-channel, 50-kc spacing com-

munications systems through their full range of frequencies—118.0 to 135.95 mc. Made of molded fiberglass with anti-rain static coating, the KA-21 has less than 10 per cent loss of power at the band extremes, compared with a 30 per cent loss by a whip antenna. It has a 50-ohm output impedance. A back-up plate and neoprene gasket come with the antenna.

Miniaturized headset-microphone combination, containing microphone and receiver in a single capsule (and adaptable to headband, glasses or oxygen mask) is being marketed by Pantronics, Inc., 111 Josephine St., Santa Cruz, Calif. Developed initially for United Airlines, the two-ounce



unit provides frequency response of 250 cycles to 4,000 plus or minus 6 db, noise cancelling characteristics (operational in 120 db ambient noise environment). Designated the MS-50, the unit complies with all applicable TSO's; operates with a dynamic mike, but can be used with carbon mike circuitry with adaptor.

Recent development of ALCOR Aviation, Inc. 2905 Bandera Rd., San Antonio, Tex. is a sensitive aircraft mixture control indicator. Consisting of only two parts—the meter (as pictured) and a thermocouple which works off an exhaust probe—the ALCOR indicator is engineered to present the best fuel-air mixture from the standpoint of both economy and power. Available for single engine (Model 125) and twin-engine aircraft (Model 120) which is shown above.



Low-cost audio system, similar to those now in operation by large aircraft, has been developed for general aviation aircraft by Dot Airtronics of Lindenhurst, N.Y. Selling for \$99, the complete system includes the transmitter relay switch and audio selector switches for a 2 1/2 system plus ADF. It is also wired to take a speaker amplifier which may be purchased for an additional \$39.95. Dot offers a choice of audio panels designed to fit individual aircraft requirements.



Gulfstream's short-field capabilities enable it to use more than 1,500 airports in the United States and Canada, bringing its passengers closer to departure and arrival points. Add to this complete independence of ground handling equipment, an exceptional climb rate, cruising speed of 350 mph to 30,000 feet—all at operating costs lower than piston-engine aircraft. That's Gulfstream flexibility.

Long flights? With leading corporations expanding their world markets regularly, transoceanic flights are commonplace in Gulfstream operations. Today, you might see Gulfstreams in Japan, Australia, South Africa, India, Spain, Germany, England and a score more countries.

Powered by Rolls-Royce Dart turboprop engines, Gulfstreams fly at intermediate and jet altitudes and, with all-weather operations assured, you fly in "home-office" comfort. Of the many companies operating Gulfstreams today, seven have added a second Gulfstream to their business fleets. Four companies and the FAA have added a third. Flexibility, Performance, Comfort. These are the things that make the Gulfstream the ultimate in business airplanes.

For demonstrations contact: Atlantic Aviation, Wilmington, Del.; Pacific Airmotive, Santa Monica, Calif.; Southwest Airmotive, Dallas, Tex.; Timmins Aviation, Montreal, Can.



**GRUMMAN**

AIRCRAFT ENGINEERING CORPORATION

Bethpage • Long Island • New York

FLYING—November 1962

Exhibit C-1

1203



IN THE UNITED STATES DISTRICT COURT  
FOR THE SOUTHERN DISTRICT OF NEW YORK

-----  
PLANTRONICS, INC.,

Plaintiff,

v.

ROANWELL CORPORATION,

Defendant.  
-----

Civil Action No.

72 CIV 1625

Judge Conner

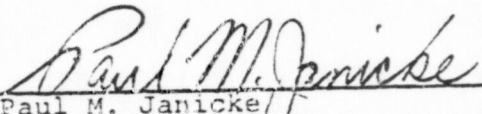
PLAINTIFF'S SUPPLEMENTAL RESPONSES

TO DEFENDANT'S REQUEST

FOR ADMISSIONS

Plaintiff supplements its responses to Defendant's Request for Admissions, dated Aug. 30, 1974 as follows:

1-5. Objection is made to each of these requests on the ground that it relates only to Plaintiff's British patent, not here in suit, and to no issue in the present case. The facts of publication are admitted as requested.

  
Paul M. Janicke  
ARNOLD, WHITE & DURKEE  
2100 Transco Tower  
Houston, Texas 77027  
713/621-9100

Robert Neuner  
BRUMBAUGH, GRAVES, DONOHUE  
& RAYMOND  
30 Rockefeller Plaza  
New York, New York 10020  
212/489-3300

Attorneys for Plantronics

1204

VV

GREAT BRITAIN AND NORTHERN IRELAND,  
LONDON, ENGLAND.  
EMBASSY OF THE UNITED STATES OF AMERICA.

SS:

II ..... Micaela A. Cella  
Vice Consul of the United States of America at London, England, duly  
hereby make known and certify to all it may concern, that the signature  
"..... G. M. E. White ....."  
"....." subscribed to the annexed certificate, is of  
the true and proper handwriting of ..... Miss G. M. E. White, Deputy Secretary  
and Legal Adviser of the Civil Aviation Authority, London, England,  
.....  
that the seal affixed to the said certificate is the seal of the ..... Civil  
Aviation Authority, London, England,  
.....  
and that to all acts signed as the annexed full faith and credit are and ought to  
be given in judicature and thereout.

IN TESTIMONY WHEREOF I have hereunto set my  
hand and affixed the seal of the Consular Service of  
the United States of America at London, England,  
aforesaid, this ..... seventh  
day of ..... June ..... 1973

00723820  
RECEIPT NO. ....  
TARIFF ITEM NO. ....  
FEE: \$2.50 = 188704 £1.02  
~~NO RES. PRESENTED~~

*Micaela A. Cella*  
Micaela A. Cella  
Vice Consul of the United States  
of America at London, England

Ex. VV  
1205

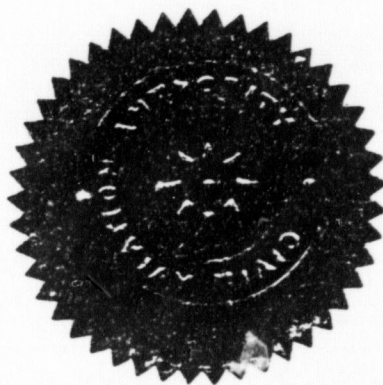
I, Gillian Mary Eve White, Deputy Secretary and Legal Adviser to the Civil Aviation Authority, whose principal office is at Aviation House, 129 Kingsway, London WC2, England, do hereby certify that to the best of my knowledge and belief the document attached hereto and marked G.W.1 is a true copy of ATCEU Note No 154 relating to user trials of the Plantronics Model MS-50 lightweight headset and was issued by the Ministry of Aviation in October 1962.

Signed

*Gillian M E White*

(MISS) G M E WHITE  
6 June 1973

The Seal of the Civil Aviation Authority authenticated by the signature of Miss G M E White, a person authorised by the Civil Aviation Authority (pursuant to paragraph 17 of Schedule 1 to the Civil Aviation Act 1971) for that purpose.



*Gillian M E White*

1206



Unclassified

ATCEU NOTE No. 154

MINISTRY OF AVIATION

AIR TRAFFIC CONTROL EXPERIMENTAL UNIT  
LONDON AIRPORT

USER TRIALS OF THE PLANTRONICS MODEL MS-50  
LIGHTWEIGHT HEADSET

No part of this document should be reproduced in any form  
without the permission of the Ministry of Aviation

This Note is for the personal use of the recipient. It does  
not necessarily represent the official policy of M. of A.

REF. M/T/130

DATE October, 1962

Ex. VV  
Approved by: Head of  
ATCEU

1207



# DISTRIBUTION

CNATCS

Secretariat ATC Board (2 copies)

Head of AORB (3 copies)

DC(1) - DC(1)

DC(2) - DC(2)

DC(3) - DC(3)

DC(4) - DC(4)

DC(5) - DC(5)

DC(6) - DC(6)

DC(7) - DC(7)

DC(8) - DC(8)

DC(9) - DC(9)

DC(10) - DC(10)

DC(11) - DC(11)

DC(12) - DC(12)

DC(13) - DC(13)

DC(14) - DC(14)

DC(15) - DC(15)

DC(16) - DC(16)

DC(17) - DC(17)

DC(18) - DC(18)

DC(19) - DC(19)

DC(20) - DC(20)

DC(21) - DC(21)

DC(22) - DC(22)

DC(23) - DC(23)

DC(24) - DC(24)

DC(25) - DC(25)

DC(26) - DC(26)

DC(27) - DC(27)

DC(28) - DC(28)

DC(29) - DC(29)

DC(30) - DC(30)

DC(31) - DC(31)

DC(32) - DC(32)

DC(33) - DC(33)

DC(34) - DC(34)

DC(35) - DC(35)

DC(36) - DC(36)

DC(37) - DC(37)

DC(38) - DC(38)

DC(39) - DC(39)

DC(40) - DC(40)

DC(41) - DC(41)

DC(42) - DC(42)

DC(43) - DC(43)

DC(44) - DC(44)

DC(45) - DC(45)

DC(46) - DC(46)

DC(47) - DC(47)

DC(48) - DC(48)

DC(49) - DC(49)

DC(50) - DC(50)

DC(51) - DC(51)

DC(52) - DC(52)

DC(53) - DC(53)

DC(54) - DC(54)

DC(55) - DC(55)

DC(56) - DC(56)

DC(57) - DC(57)

DC(58) - DC(58)

DC(59) - DC(59)

DC(60) - DC(60)

DC(61) - DC(61)

DC(62) - DC(62)

DC(63) - DC(63)

DC(64) - DC(64)

DC(65) - DC(65)

Superintendent, School of ATC, Hurn (3 copies)

Chief Instructor, Joint ATC Area Radar School, RAF, Sopley, Christchurch, Hants. (3 copies)

Superintendent, TEE, Gatwick

TEE Radar Maintenance Section, Gatwick.

TEE Radar Installation Section, Gatwick.

CASTE, Blatchley (3 copies)

CATC (For Information Only)

Divisional Controller, Southern Division (4 copies for D.C. DCO, DATCO, DRO)

Divisional Controller, Northern Division, (4 copies for D.C. DCO, DATCO, DRO)

Divisional Controller, Scottish Division (4 copies for D.C. DCO, DATCO, DRO)

DATCO, Southern Division (6 copies)

DATCO, Northern Division (6 copies)

DATCO, Scottish Division (6 copies)

Centre Superintendent, SATCO (6 copies)

STO, SATCO (3 copies)

Centre Superintendent, NATCO (6 copies)

STO, NATCO (3 copies)

Superintendent, NATCRU Antrobus (2 copies)

STO, NATCRU Antrobus (2 copies)

Centre Superintendent, Scottish ATCO (6 copies)

STO, Scottish ATCO (3 copies)

Airport Commandant, London Airport (3 copies)

ATCO i/c London Airport (6 copies)

STO, London Airport (3 copies)

Fleet Commander, CARU, Stamford

Dr. S. H. Hollingdale, Mathematics

Department, RAF, Farnborough.

W. Ross, Esq., RRE, Malvern.

J. Gough, Esq., RRE, Malvern

(for Civil Aviation Group)

AOC, UK.ATS. (3 copies)

Officer i/c, Heathrow Radar, RAF.

File:- EU/T/130

H. I. Wood Esq., O.B.E., 14 copies for  
Civil Air Attache, U.K. Mission  
British Embassy, to the FAA  
Washington, D.C., U.S.A.)

1208

MINISTRY OF AVIATION

Air Traffic Control Experimental Unit

User Trials of the Plantronics Model MS-50  
Lightweight Headset

by

F. J. L. de Frias.

Summary

A new type of lightweight headset is described, an account is given of the methods adopted in non-technical trials and the results are discussed and tabulated. The headset performed satisfactorily and was generally well received, though there were objections to the use of an earplug and criticism was made of the headband, the lead, and the lack of adjustment on the microphone tube.

Contents

1. Introduction
2. Description
3. Method of Trial
4. Results
5. Conclusions
6. Acknowledgments

Illustrations 1 to 5

Appendices 1 and 2

Approved: Head of ATCEU.

This Note is for the personal use of the recipient. It does not necessarily represent the official policy of the Ministry of Aviation.

1209

USED ON:

ROANWELL CORP.  
NEW YORK, N. Y.

DATE

DRAWN

PART NO.



## 1. Introduction

1.1. In June, 1962, General Precisions Systems Ltd., drew the attention of the Department to a new lightweight headset under evaluation in the United States and offered to make one available for trials. The offer was accepted and the ATCEU was instructed to carry out a practical evaluation from the user point of view. The instructions to the EU stated that a technical evaluation would be carried out by Tels.8(c).

1.2. Two headsets were delivered to the Department and these were released to the Unit on 14th September.

1.3. Discussion took place with Tels.8(c) during which it was decided that the two aspects of the evaluation should proceed independently and it was agreed that the Unit should carry out its practical user trials first. These were completed by 12th October and this Note outlines the methods adopted, analyses the results recorded and presents the conclusions drawn. The headsets have now been forwarded for technical evaluation.

## 2. Description

2.1. The Plantronics Model MS-50 is an integral headset containing a miniaturised microphone and receiver in a single compact capsule weighing less than one ounce. It is mounted on a clip which enables it to be snapped onto a headband or, if spectacles are worn, directly onto a spectacle temple piece. A patented acoustical tube runs from the capsule to the side of the mouth and transmits sound from the mouth to the microphone transducer in the capsule. Sound from the receiver transducer is passed through a light plastic tube to a single earplug which is inserted in one ear. The total weight of capsule, earplug, headband and lead used during the trial is two ounces. The headset is shown in Plates 1-5.

2.2. When used in an aircraft the headset is provided with an amplifier unit to connect into existing transmitter or amplifier designed for carbon microphone operation. This was not used during the trial. An oxygen mask adaptor is available and three sizes of earplugs can be supplied.

2.3. It is understood from the manufacturers that it would be possible to provide a modified headset with two earplugs for split R/T and telephone working. Whether these would be fed from a single capsule and whether, in its modified form, it would be readily adaptable to single or double earplug/single purpose or split working, as required, is not known.

## 3. Method of Trial

3.1. Because of the different functions performed by personnel in APO no one headset can be expected to be completely satisfactory for every position. A Procedural Controller moves about far more than the Radar Controller, an Assistant may be comparatively static in one position and mobile in another. In some positions a headset for R/T and Intercom. only is acceptable, with telephone service on a hand microphone telephone, while in others split headset working, with R/T in one ear and telephone in the other, is almost essential. Further, one Control Position may entail a great deal of direct verbal exchange while in another almost all liaison is effected through the intercom. system. Ideally, then, there should be a suitable headset for each function. However, this is impracticable and it must be accepted that any headset provided in large numbers must be a compromise designed to give the best possible answer at the majority of positions without necessarily being absolutely perfect at any one.

3.2. With this in mind, the trial was arranged to cover a reasonably wide range of positions so that it would be evaluated as a

1210

USED ON:	ROANWELL CORP. NEW YORK, N. Y.	DATE	DRAWN	PART NO.
----------	-----------------------------------	------	-------	----------

general purpose headset. Arrangements were made for the headsets to be used:

- (a) In the Southern Air Traffic Control Centre at both Procedural and Radar Controller positions.
- (b) In the Dynamic Simulator Experimental Operations Room at both Radar and Procedural Positions (simulated).
- (c) By Simulator Assistants in the Dynamic Simulator Input Room. These are ladies, operating Aircraft Drive Units (simulated aircraft) who carry out R/T functions (simulated transmit and receive) with no intercommunication or telephone requirement.
- (d) In Heathrow Radar, RAF, UKATS.

3.3. One headset was wired to give both telephone and R/T in the single earpiece, the other for R/T only. The use of the latter was confined to the Dynamic Simulator positions where it was acceptable for the telephone service, if any, to be on hand microphone telephone.

3.4. A questionnaire was drawn up (see Appendix 1) which aimed at both a subjective and comparative approach. General criticism, suggestions for improvement and general remarks were also invited.

3.5. Excluding the use of the headset by Heathrow Radar, a total of 22 subjects took part in the trial; 6 Simulator Assistants, 8 Procedural Controllers and 8 Radar Controllers. As far as possible each subject used a headset for a whole day or long watch. Briefing and instructions were confined to an explanation of the working and fitting of the headset, which included the option to use it either with the headband or on spectacles. As the question forms were collected participants were encouraged to discuss the trial and amplify their written remarks.

#### 4. Results

4.1. The headsets were in regular use, without special care being taken in their handling or stowage, and, in spite of their seemingly frail construction, no malfunctioning, breakages, or faults occurred in the headsets themselves.

4.2. From the tabulated results of the replies to questions (Appendix 2) it will be seen that the consensus of opinion is that in general performance and comfort the headsets appear to be 'Satisfactory' (which can be taken to mean it is at least as good as the headset in current use), or 'Good', which is interpreted as better than the existing headset. Adverse grading on all features other than Question 13 (Intrusion level of unwanted noise) is very much a minority view. In some cases the adverse comment was related to associated factors, such as the length of the cord or objection to the earplug.

4.3. Caution must be exercised in the interpretation of votes for and against. For example, the numerical breakdown of the question on earphone comfort is: Good 11, Satisfactory 8, Uncomfortable 3. However, examination of the Suggestions and General Remarks shows no fewer than 11 reports containing adverse comment in one form or another. These range from a blunt statement:

"I personally do not like a piece of equipment stuck in my ear" to a report that if the plug is thrust firmly into the ear the sensitivity is such that, even with the volume control turned back as far as possible, a strong transmission could be uncomfortably loud. In fact the General Remarks space made interesting reading. Typical are the following:

1211



"At last -- a lightweight headset! In all respects the improvement is almost unbelievable....."

".....Very slight head movements aggravated this condition (intermittent reception). The headset was worn without the headband and the spectacle clip appeared to be very insecure".

"At least a dozen aircraft have reported the reception to be very clear; one in particular stated 'clearer than ever heard from London Radar before'."

"The sensitivity is so high that interference and distortion tend to be exaggerated".

"The sooner we are issued with headsets of this type the better".

"It is necessary to insert the earpiece very firmly in the ear to keep it in (place) and I find this most uncomfortable".

4.4. Three main criticisms can be levelled:

#### 4.4.1. The Earplug

Despite its good performance this is not popular. The objection is primarily aesthetic but many reasons can be regarded as most pertinent. A common complaint was that it needed to be firmly placed in the ear and then the capsule sensitivity resulted in an uncomfortably high level of response which could not be reduced even with minimum volume control. Additionally, if the headset were modified to give split headset working (telephone in one ear, R/T in the other) direct verbal liaison with an alongside position would become difficult. On the other hand, if a single earpiece is retained, ambient noise can be a distraction in the unoccupied ear. With a normal headset the earpiece can quickly and easily be adjusted to cover an ear, to half cover an ear or to completely uncover an ear for direct conversation. With the earplug such adjustment for needs of the moment are not possible. Although possibly associated with the aesthetic objections, some participants raised the question of medical approval. In a warm, humid atmosphere and certainly in tropical and sub-tropical climates, minor inflammation of the outer ear is not uncommon. Medical opinion should be sought as to whether the continual use of an earplug is likely to aggravate such conditions and, in any case, consideration needs to be given to the discomfort which can arise when such a condition is present from unrelated causes.

#### 4.4.2. The Lead

The headsets were supplied complete with amplifiers, which were not needed, and about three feet of light flex on which the adaptor plug was fitted by the Unit Tels. This was too short for most positions and led to the only malfunction experienced during the trial, occasional intermittent reception due to the lead pulling out of the adaptor plug. Ideally there should be a generous length of stout lead, preferably of the 'coiled spring' type, running from the plug-in point to a lapel clip with a very light lead thence to the capsule. It is appreciated that shortness of the lead was due to the method of adaptation rather than to any limitation of the headset itself.

#### 4.4.3. The Microphone Tube

This appeared amazingly efficient and very unobtrusive once it had been correctly positioned. However, being critically

1212



tuned in length and presumably in curvature, the only adjustment possible was in the angle at which the capsule was clipped to either the head band or the spectacle frame. Some participants unscrewed one turn on the tube thread to obtain a further adjustment. Although this did not appear to affect the efficiency of the microphone during the trial it might not be acceptable over a protracted period. Because of the lack of adjustment the mike tube could not be regarded as convenient. In no case could the headband be slipped on with the confident knowledge that the microphone would then be in more or less a naturally comfortable position. During adjustment the end of the tube could be poked into a nostril or the corner of the mouth. On the whole the impression was gained that it was 'fiddly'.

4.5. A few minor criticisms are worthy of note. The headband was not completely acceptable. Some asked for a double band, others for a foam rubber lining, some expressed the view that it was insecure. Head sizes ranged from  $6\frac{1}{2}$  (small) to  $7\frac{1}{2}$  (large) but the sample was too small to associate any criticism with head size. On the whole it is likely that the feeling of insecurity and, again, 'fiddliness', was due more to the lack of weight than valid cause for complaint.

4.6. Despite some adverse comments, and it must be emphasised that these were far less both in number and vehemence than was anticipated, it is obvious that the headsets proved successful during this limited trial. An alternative to the earplug (possibly a contact device), a readily adjustable microphone tube, a purpose-designed lead and an improved headband are possible improvements. It was suggested during the trial that the headset is so light that it might be feasible to incorporate the capsule into a self supporting earpiece hooked over the ear as is done with some types of deaf aids.

## 5. Conclusions

5.1. There can be little doubt that this represents a great step forward in headset technique. Normally equipment which is a radical departure from accepted practice in the ATC field is regarded with caution and reserve but in the case of this headset, despite its being completely different from any in past or current use, the 'acceptability factor' can be rated as 'Very High'.

5.2. The clarity and quality of transmission and reception was extremely good, though some users complained that the volume of reception was uncontrollably high and led to discomfort.

5.3. The earplug was unpopular and a contact device might be an acceptable alternative. There are operational objections to earplugs, especially when considering the use of two of them for split headset working, and it is also felt that medical opinion should be taken on the continual use of earplugs with regard to either causing inflammation or aggravating an existing inflammatory condition.

5.4. The headset lead is unsatisfactory for ATC purposes. It should consist of a stout length of lead, preferably of the "coiled spring" type, running from the connector plug to a lapel clip with a very light lead thence to the capsule.

5.5. The microphone tube has not sufficient range of movement and a more readily adjustable tube is desirable.

5.6. The headband was criticised by some users but it is not clear whether the criticism was valid or due to the extreme lightness of the headset.

5.7. The possibility of making a self-supporting capsule and microphone tube to hook over the ear is worthy of consideration.

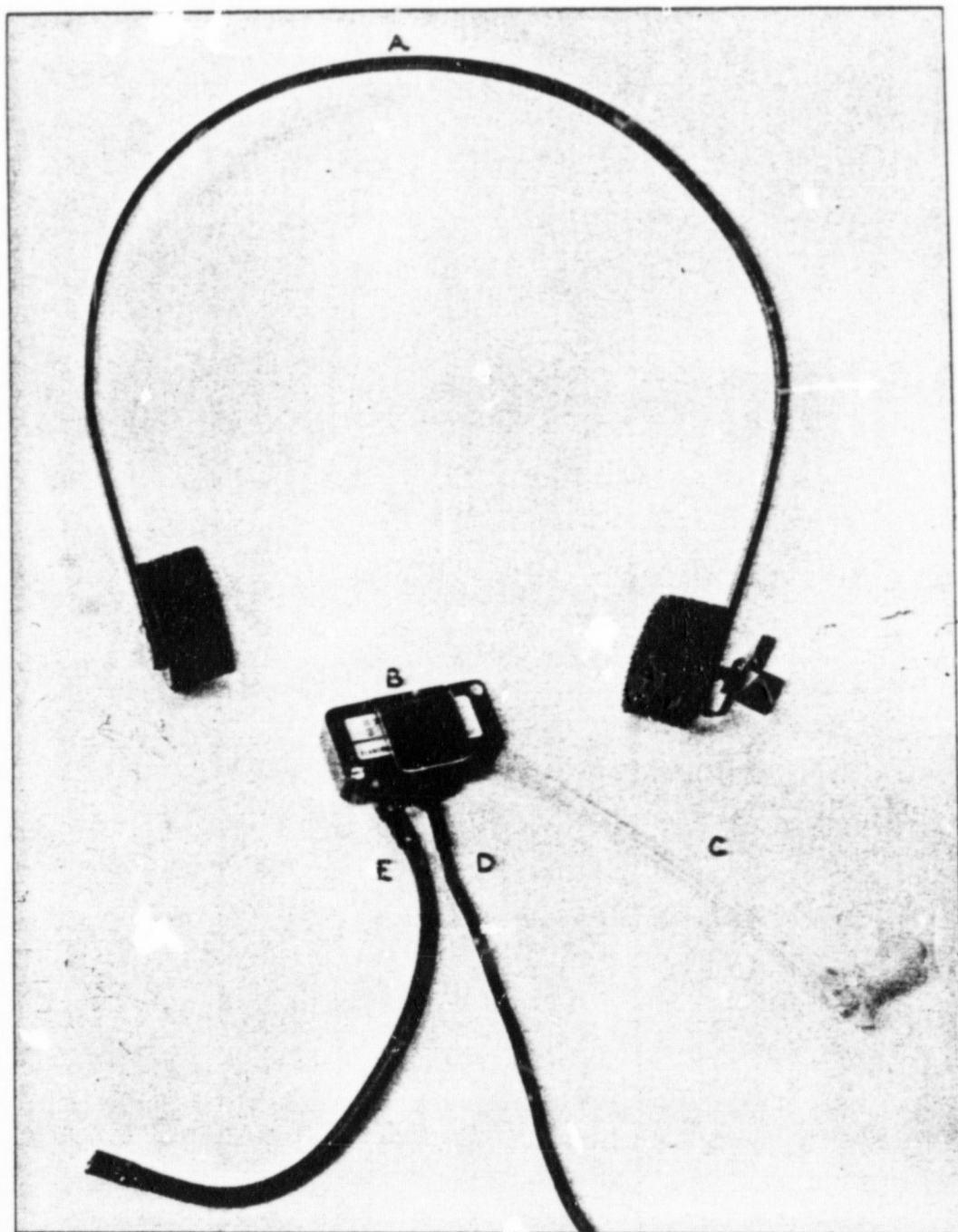
5.8. It is understood that other manufacturers are producing ultra-lightweight headsets of similar, though not identical, features. It is suggested that further trials should take place with these headsets with a view to finding the most suitable. From comments received during the trial it is apparent that a headset of this type is sorely needed by ATCO's.

6. Acknowledgments

The assistance of the staff of the Southern Air Traffic Control Centre is gratefully acknowledged.

1214

ILLUSTRATION 1



- A - Headband
- B - Capsule and Combined Clip
- C - Tube and Earplug
- D - Lead
- E - Acoustic Tube Microphone

1215



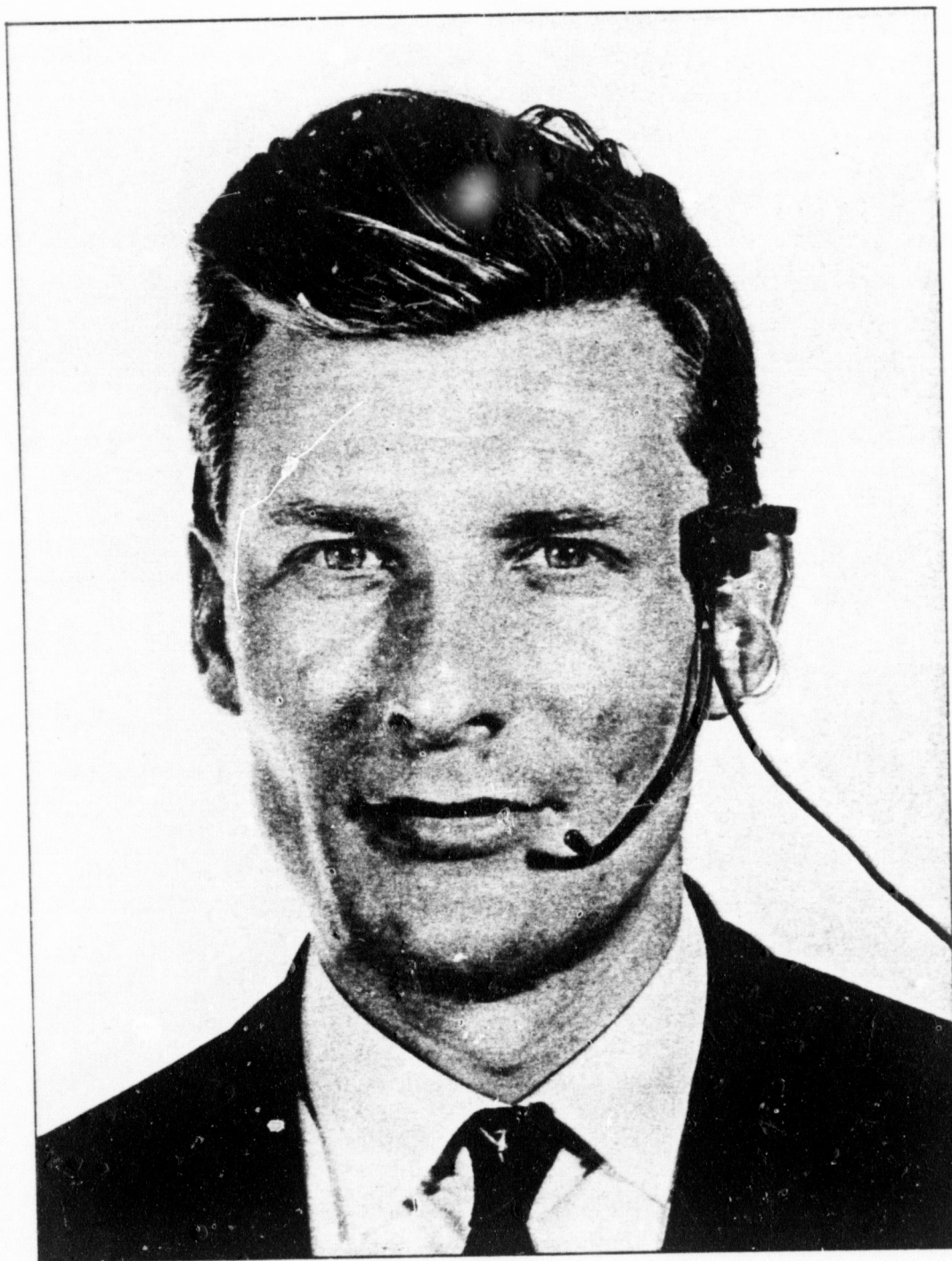
ILLUSTRATION 2



Capsule assembly mounted on the headband with  
earplug and microphone in the operating position.

12.6

ILLUSTRATION 3



Front view of headband assembly.

1217



ILLUSTRATION 4



Side view of assembly mounted on spectacles.



1003

Q 2

ILLUSTRATION 5



Front view of assembly mounted on spectacles.

1219

LIGHTWEIGHT HEADSET TRIALS

Appendix 1

Please delete as appropriate.

Date: .....

Name of Tester: .....

1. Headset tested:- Headset No.1/Headset No.2/Headset No.3.
2. Sector or Radar Position at which test carried out:- .....
3. General Comfort:- Good/Satisfactory/Poor. Spectacles:- Worn/Not worn.
4. Usefulness of Spectacle Support Feature:- Good/High/Doubtful/Useless.
5. Adjustability for Comfort:- Good/Satisfactory/Poor.
6. Adjustability for Size:- Good/Satisfactory/Poor. Hat Size:- .....
7. Microphone position:- Good/Satisfactory/Poor.
8. Adjustment of Microphone position:- Good/Satisfactory/Poor.
9. Earphone comfort:- Good/Satisfactory/Uncomfortable.
10. Apparent sensitivity to volume variation:- Good/Satisfactory/Poor.
11. Volume of Reception:- Good/Satisfactory/Poor.
12. Clarity of Reception:- Good/Satisfactory/Poor.
13. Intrusion level of unwanted noise:- High/Satisfactory/Low.
14. From requests from pilots etc. for repeats or from }  
mishearings, was your impression that your trans- } Good/Satisfactory/Poor.  
missions were:- }
15. Fatigue Factor (by comparison with existing headsets):- Better/No Change/Worse
16. Does Cord Tangle:- Yes/No.
17. Were any of the above factors influenced by head or general movement? If so,  
please give details:-

18. How does this headset compare with existing headsets?  
Great improvement/Improvement/About the same/Inferior.
19. Can you suggest any improvement to this headset?

GENERAL REMARKS

Signed: .....

1220

Analysis of Replies to Questionnaire

Appendix 2

Percentage of Answers within each Category

	Simulator Operators			Procedural Controllers			Radar Controllers			Overall Independent of Function		
	G.	S.	P.	G.	S.	P.	G.	S.	P.	G.	S.	P.
Comfort Questions 3,5, 6,9 and 15	53	20	27	59	38	3	54	41	5	56	34	10
Adjustment Questions 7 and 8	33	50	17	50	50	0	46	38	16	44	46	10
Performance Questions 10,11, 12,13 and 14	53	30	17	75	15	10	72	28	0	68	24	8
Overall Independent of Classification	50	29	21	64	31	5	61	35	4			

Grand Overall Conclusion 59 32 9

Key: G = Good. S = Satisfactory. P = Poor.

Numbers of Answers in each Category

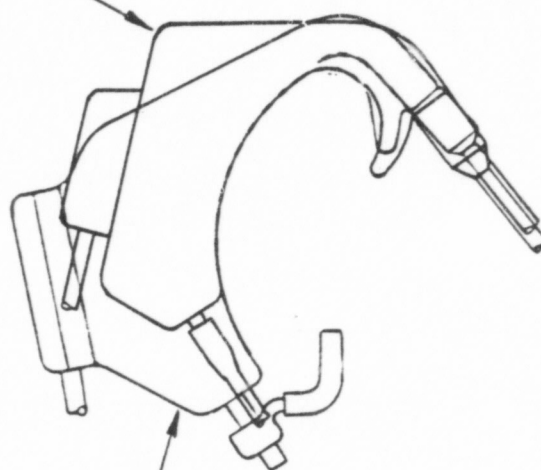
	Simulator Operators	Procedural Controllers	Radar Controllers	Total
Comfort	30	39	37	106
Adjustment	12	16	13	41
Performance	30	40	39	109
Total	72	95	89	256

1221



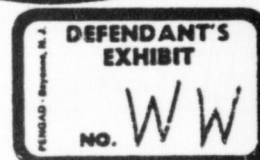
OUTLINE DRAWING  
OF  
PPI STARSET  
&  
ROANWELL R-70 HEADSET

STARSET



R-70

1222



USED ON:

ROANWELL CORP.  
NEW YORK, N. Y.

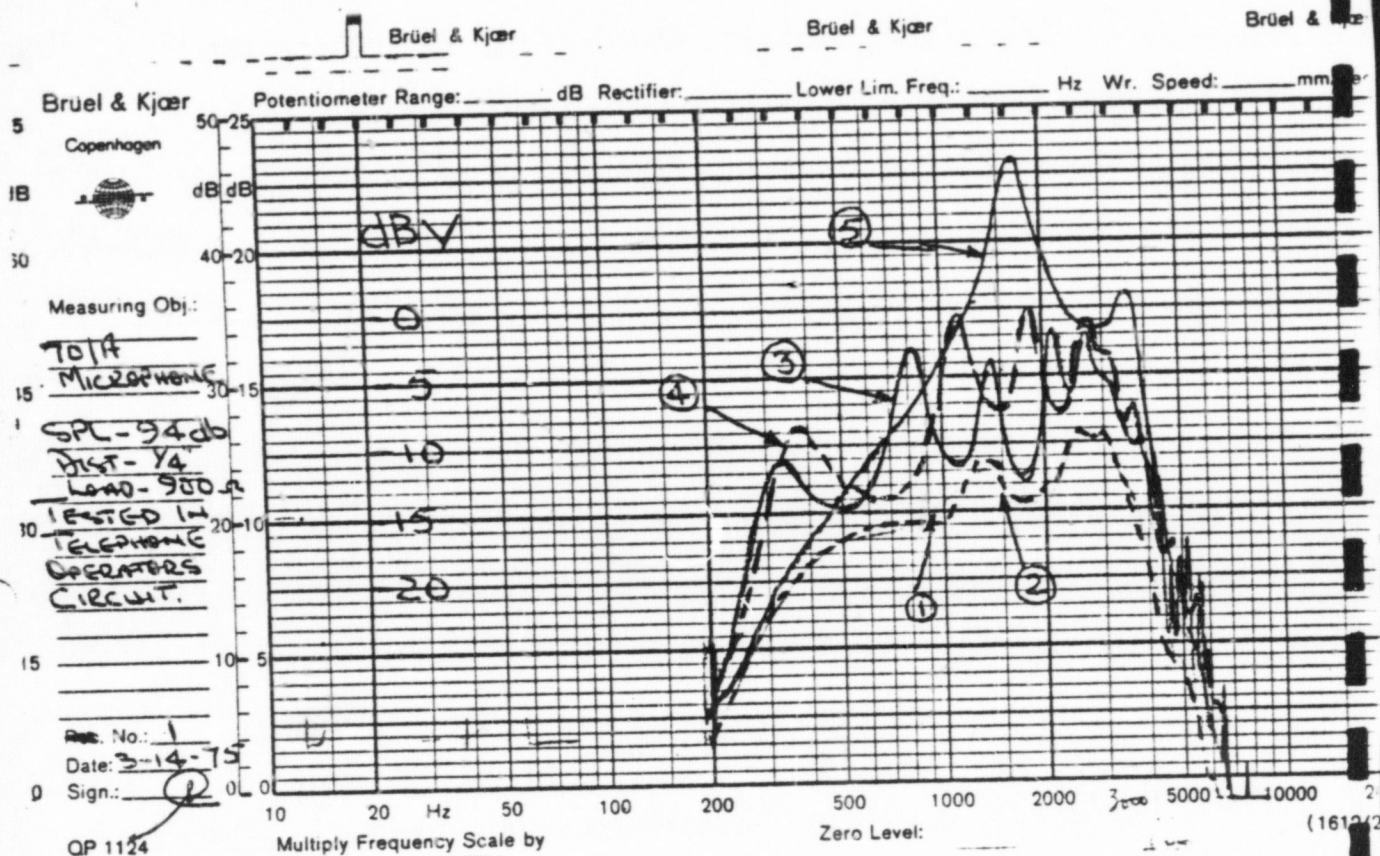
DATE

DRAWN

PART NO.

EFFECT OF THE ACOUSTICAL PATH FROM TIP OF SPEECH  
TUBE TO TRANSDUCER / BOOT SOUND INPUT.

R 70 TYPE HEADSET



CODE TO ABOVE FREQUENCY RESPONSE CURVES.

1. SOLID GREEN - SPEECH TUBE FULLY RETRACTED WITH FILTER.
2. DOTTED BLACK - SPEECH TUBE FULLY EXTENDED WITH FILTER.
3. SOLID RED - SPEECH TUBE FULLY EXTENDED WITHOUT FILTER.
4. DOTTED RED - SPEECH TUBE FULLY RETRACTED WITHOUT FILTER.
5. SOLID BLACK - MIC ELEMENT IN RUBBER BOOT ONLY

DEFENDANT  
EXHIBIT  
NO. XX

LECH PORADOWSKI  
3-14-1975

1223

EFFECT OF THE ACOUSTICAL PATH FROM TIP OF SPEECH  
TUBE TO TRANSDUCER / BOOT SOUND INPUT

R 71 TYPE HEADSET

Brüel & Kjær

Potentiometer Range: \_\_\_\_\_ dB Rectifier: \_\_\_\_\_ Lower Lim. Freq.: \_\_\_\_\_ Hz Wr. Speed: \_\_\_\_\_ mm/sec

Copenhagen

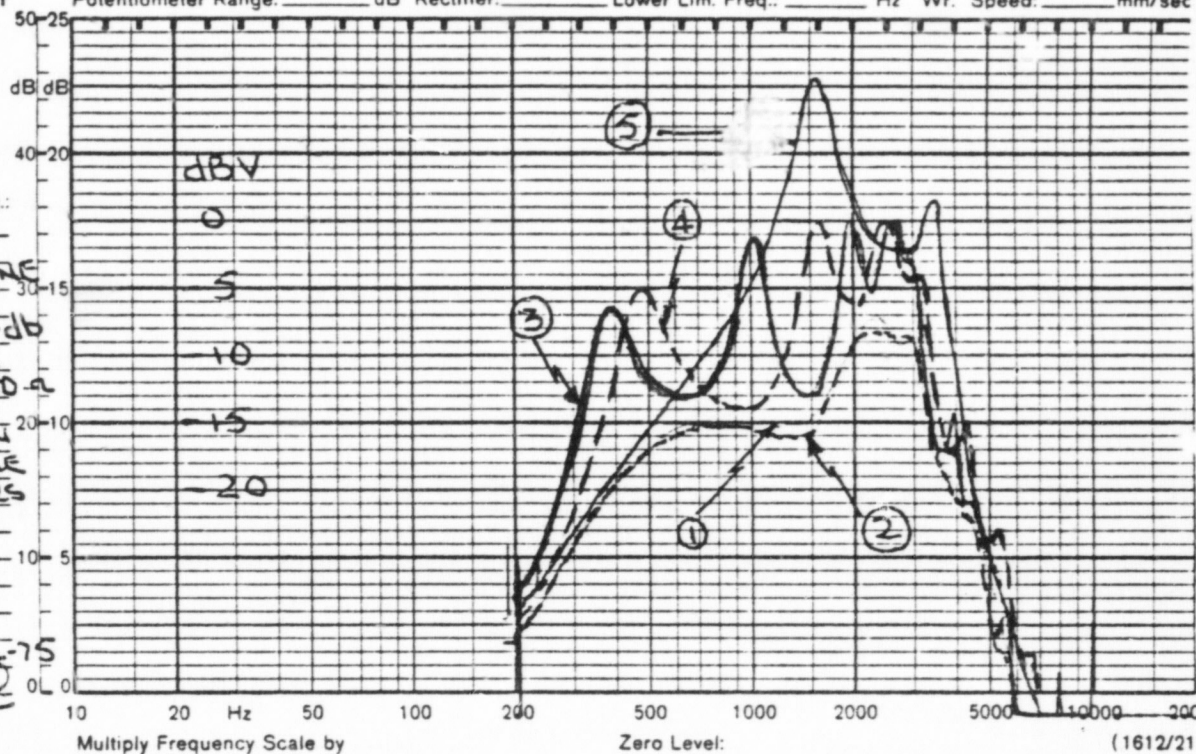


Measuring Obj.:

701A  
MICROPHONE  
SPL-94db  
Dist. Y4  
Load - 900-Ω  
TESTED IN  
TELEPHONE  
OPERATORS  
CCT

No. 1  
Date: 3-14-75  
Sign: [Signature]

QP 1124



CODE TO ABOVE FREQUENCY RESPONSE CURVES

- SOLID GREEN - SPEECH TUBE FULLY RETRACTED WITH FILTER.
- DOTTED BLACK - SPEECH TUBE FULLY EXTENDED WITH FILTER.
- SOLID RED - SPEECH TUBE FULLY EXTENDED WITHOUT FILTER.
- DOTTED RED - SPEECH TUBE FULLY RETRACTED WITHOUT FILTER.
- SOLID BLACK - MICROPHONE ELEMENT IN RUBBER BOOT ONLY.

DEFENDANT'S  
EXHIBIT  
NO. XX-2

LECH PERADOWSKI  
3-14-1975

1224



# ACOUSTIC MEASUREMENTS

---

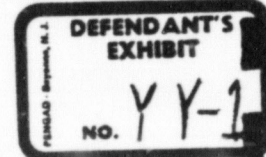
LEO L. BERANEK, S.D., D.Sc. (Hon.)

*Associate Professor of Communication Engineering  
and  
Technical Director of the Acoustics Laboratory  
Massachusetts Institute of Technology*

*Prepared under the Auspices of  
The Office of Naval Research  
Navy Department, Washington, D. C.*

---

JOHN WILEY & SONS, INC., NEW YORK  
CHAPMAN & HALL, LIMITED, LONDON



COPYRIGHT, 1949  
BY  
JOHN WILEY & SONS, INC.

*All Rights Reserved*

*This book must not be reproduced in whole or in  
part in any form without the written permission  
of the publisher, except for any purpose of the  
United States Government.*

FOURTH PRINTING, APRIL, 1959

PRINTED IN THE UNITED STATES OF AMERICA

1226

about 10 db higher. The corresponding thresholds for continuous spectrum noises, expressed in terms of spectrum level, are 90, 112, and 120 db above  $0.0002 \text{ dyne/cm}^2$ .

**Diffraction and Resonance.** Spherically shaped objects exhibit a diffraction resonance, and the human head is no exception. Furthermore, the ear canal is a small resonant tube. Wiener<sup>17</sup> and Wiener and Ross<sup>18</sup> have investigated the effects of these two factors on the sound delivered to the eardrum. Their results are summarized in Fig. 5-12. Curve (a) gives the ratio of the

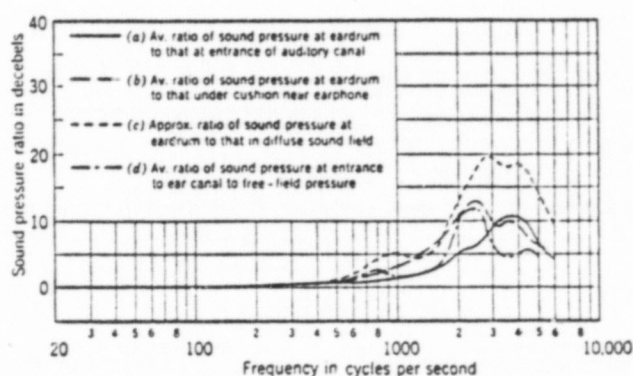


FIG. 5-12 Curves showing the ratios of sound pressures measured in and around the ear. Curve (b) is based on meager data. Curve (c) is calculated. (Courtesy F. M. Wiener.)

sound pressure at the eardrum to the pressure at the entrance of the ear canal for a free sound field. Curve (b) gives the ratio of the sound pressure at the eardrum to the pressure immediately beneath a dynamic earphone with a close-fitting cushion. Curve (c) gives the ratio of the sound pressure at the eardrum to that measured in a diffuse sound field before the person entered it. Curve (d) gives the average ratio of the sound pressure at the entrance to the ear canal to that measured in a plane wave sound field before the person entered it. The person faced the source of the plane wave when the pressure was being measured. The results for cases when the listener does not face the source of sound are shown in Fig. 5-13 for a plane wave.

**Loudness and Loudness Level.** Loudness is a subjective quantity. It is defined as that aspect of auditory sensation in terms of which sounds may be ordered on a scale running from "soft"

1227



# Speech and Hearing in Communication

*By*

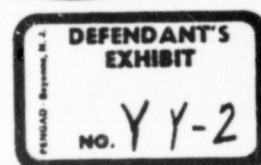
HARVEY FLETCHER, Ph.D.

*Formerly Acoustical Research Director,  
Bell Telephone Laboratories, Inc.*

ROBERT E. KRIEGER PUBLISHING COMPANY  
HUNTINGTON, NEW YORK

1972

1228



ORIGINAL EDITION 1953  
REPRINTED 1958, 1961, 1965, 1972

Printed & Published by  
ROBERT E. KRIEGER PUBLISHING CO. INC.  
BOX 542, HUNTINGTON, NEW YORK 11743

copyright 1953 by  
Litton Educational Publishing Inc.

Reprinted by arrangement with  
VAN NOSTRAND REINHOLD COMPANY

Library of Congress Card No. 52-11172

All rights reserved, no part of this book may be reproduced  
in any manner, without written permission of the publisher

1229

## CHAPTER 7

### MECHANISM OF HEARING

Vibrations in the sound wave communicate mechanical vibrations to the eardrum which, in turn, communicates the vibration to the inner ear where the nerve endings are excited.

The ear mechanism may be divided into three general parts: the outer ear, the middle ear, and the inner ear. The outer ear consists of the external part or pinna, and the ear canal or auditory meatus. The middle ear contains three small bones or ossicles called, respectively, the hammer, the anvil, and the stirrup. The inner ear contains the cochlea, vestibule, the semicircular canals, and the endolymphatic duct and sac. In the cochlea are located nerves which give us the sense of hearing, and in the semicircular canals are located nerves which cause reactions concerned with the maintenance of equilibrium.

Fig. 75 shows a schematic diagram of the parts of the ear with the outer ear much enlarged. The pinna is used by a number of animals to aid in collecting the sound. The human pinna has almost lost this function, but a cupped hand held to the ear sometimes supplants it.

The ear canal, or auditory meatus, G, is about three centimeters long. It is closed at the inner end by the eardrum or tympanic membrane. Attached to the drum from its center and upwards by a long part called the handle is the first of the ossicles, called the hammer. The top of the hammer is connected with the anvil by a joint, and the anvil, in turn, is connected to the stirrup, the small bone that conveys the motion through the oval window to the labyrinth in the inner ear. The part of the stirrup lying in the oval window is flat and is called the foot plate. It is held in place by an annular ligament of the membrane which prevents the fluid of the inner ear from coming into the middle ear. The mastoid cells are connected to the middle ear but are not concerned with hearing.

The inner ear has a dense bony wall forming an irregular cavity, referred to as the bony labyrinth and is filled with fluid. It contains a smaller structure of the same general shape called the membranous labyrinth which contains a fluid that is separate and distinct from the rest of the fluid in the bony structure. Its walls are formed by a very soft membrane so that sound waves pass through them with little obstruction. The cavity of the inner ear is encased in solid bone and has only



two small openings into the middle ear; one, at the oval window into which fits the stirrup and one, at the round window indicated at *r*. An elastic membrane is stretched across the round window and is sometimes referred to as the secondary eardrum. The middle ear is connected to the outside air by means of a small tube called the Eustachian tube, which opens into the upper part of the throat behind the nasal cavity.

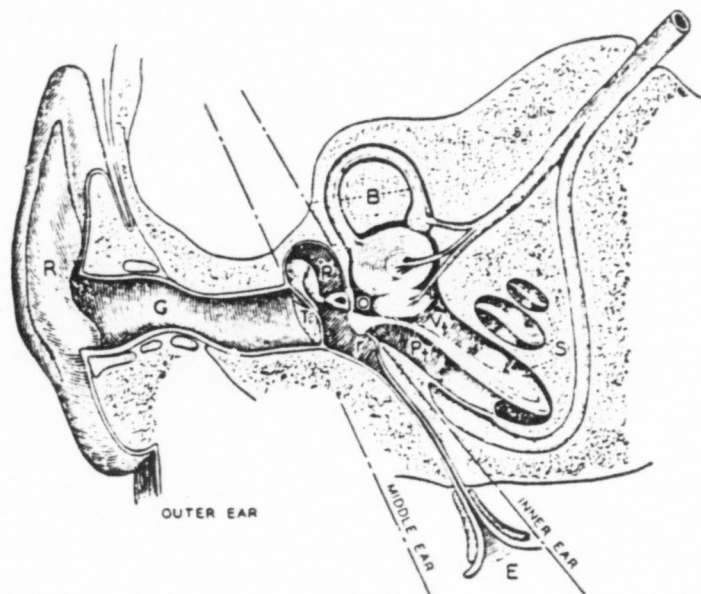


FIG. 75.—SEMIDIAGRAMMATIC SECTION THROUGH THE RIGHT EAR (CZERMAK): G, EXTERNAL AUDITORY MEATUS; T, MEMBRANA TYMPANI; P, TYMPANIC CAVITY; O, FENESTRA OVALIS; R, FENESTRA ROTUNDA; B, SEMICIRCULAR CANAL; S, COCHLEA; VT, SCALA VESTIBULI; Pt, SCALA TYMPANI; E, EUSTACHIAN TUBE; R, PINNA.

The inner ear consists of three principal parts; namely, (1) the semi-circular canals which take no part in the mechanism of hearing, but serve as an organ of balance, (2) the vestibule, the space just behind the oval window, and (3) the cochlea which is really the end organ of hearing. Cross-sections of the cochlea as it twists into a relatively long spiral of two and three-quarter turns like a snail shell are indicated at S in Fig. 75. The center of the spiral is a bone called the modiolus, which is perforated to allow space for the auditory nerve. The nerve enters the base of the cochlea and outside it unites with the nerves from the semicircular canals into two parts forming the eighth cranial nerve. The cochlea is divided along its length into three parts by the basilar membrane and

1231

214

Record Copy

COMMUNICATIONS DEVELOPMENT TRAINING

---

DESIGN PRINCIPLES OF  
ELECTROACOUSTIC DEVICES

F. F. ROMANOW

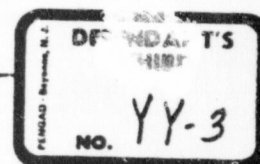
INSTRUCTOR-IN-CHARGE

---

BELL TELEPHONE LABORATORIES, INC.

PERSONNEL DEPARTMENT | 463 WEST STREET, NEW YORK 14

---



This material is the property of BELL TELEPHONE LABORATORIES, Incorporated  
and is loaned on condition that it be returned to the laboratories upon  
termination of employment or upon request by the laboratories prior thereto.

1232

BELL TELEPHONE LABORATORIES, Inc.

First Edition, 1949

Printed in U. S. A.

1233



## PREFACE

These notes were prepared for use in the Bell Telephone Laboratories' Communications Training School. They are intended as an introductory text in the field of transducer design. Although the engineering point of view is emphasized, the underlying theory and the mathematical developments of useful formulas are quite fully set forth in order to show their origins and derivations. Where possible, equations are put into forms equivalent to those of electrical circuits; by analogy, then, solutions are readily available from the large background of electrical theory.

The main problem which is considered is that of determining the steady-state transmission properties of various types of vibrating structures over a wide range of frequencies. The emphasis is on the generation and reception of sound, rather than on its transmission through various media. While the text is intended to give basic theory and information on transducer design, enough particular cases of practical instruments are discussed to illustrate the more detailed engineering design requirements. In addition these notes contain a description of the physical characteristics of speech and hearing upon which the design of transducers must be based as well as a discussion of the problems encountered in using such instruments in communication systems.

The reader who is more interested in the transmission phases of sound will find this part of the subject covered in such excellent books as Lord Rayleigh's "Theory of Sound," P. M. Morse's "Vibration and Sound," and Stewart and Lindsay's "Acoustics."

Available as source material in writing these notes have been the out-of-hour texts covering similar material prepared by R. L. Wegel and E. L. Norton, both of whom have contributed greatly in making the design of transducers an engineering science. Much of the material which served as a basis for these notes has been contributed by P. B. Flanders who also wrote Chapter 5. R. H. Nichols, in addition to writing Chapter 7, has prepared final drafts for four additional chapters. E. E. Mott contributed Chapter 6 and C. T. Molloy prepared the final draft of Chapter 4.

F. F. Romanow  
BELL TELEPHONE LABORATORIES, INC.  
August 1949

1234

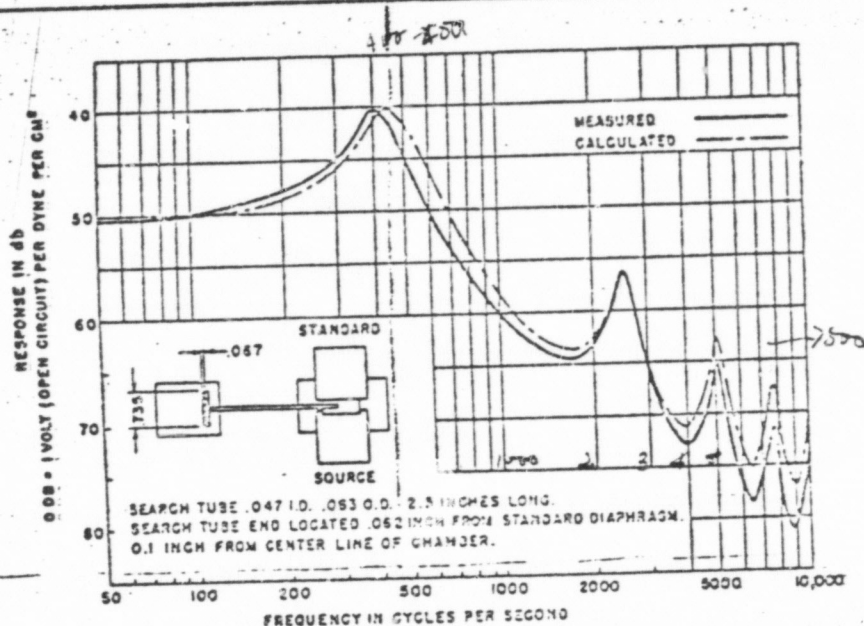


Figure 4-6 Comparison Between Measured and Calculated Calibration Curves for a 640AA Microphone With a Search Tube

One application of the theory presented above occurs in the design of search tubes for microphones. A search tube is a small-diameter tube coupled to the diaphragm of a microphone in order to measure pressures in regions too small to be accessible to the microphone. Such a device is shown in Figure 4-6. Usually what is known is the open-circuit voltage output of the microphone for a given acoustic pressure on its surface. What must be calculated, in the design problem, is the open-circuit voltage output of the microphone for a given acoustic pressure at the end of the probe tube. Figure 4-6 shows a comparison of a calculated and measured curve for a system comprising a microphone and probe tube. The agreement is quite good but in order to obtain this agreement the propagation constant had to be adjusted empirically. A substantial increase in attenuation constant was necessary. This illustrates the remark made at the beginning of this section about experimentally determining the propagation constant. However, it should be borne in mind that the tube used in this calculation was quite small (0.047 inch) and it is in this region where trouble might be anticipated. For larger tubes of the order of one centimeter or more in diameter, the experiments of Mason<sup>23</sup> and Fay<sup>24</sup> show good agreement with the theory.

#### 4.7 HORNS<sup>25</sup>

The theory developed so far has dealt with tubes of constant cross section. There are however some important cases where tubes of variable cross section can be treated by means of one-dimensional acoustics. The general pattern of analysis is similar to that used for tubes of constant cross section. First an approximate differential equation describing the motion of the air inside the tube is derived.

1235

Next a solution of this differential equation is obtained. Finally pressure, velocity, and impedance functions are obtained. A horn is a tube of varying cross section where the cross section increases monotonically according to a given law from the small end (called the horn throat) to the large end (called the horn mouth). The horns most in use today are called exponential horns and this is the only type which will be discussed here. In this type of horn the area of the cross section varies according to the law:

$$A(x) = A_0 e^{2\alpha x}, \quad (4-94)$$

where  $A(x)$  = the cross-sectional area at distance  $x$  from the throat,

$A_0$  = the cross-sectional area at the throat,

$\alpha$  = the flare constant of the horn.

There are several other well known types of horns such as the conical,<sup>25</sup> parabolic,<sup>26</sup> and hyperbolic,<sup>25,27</sup> and discussion of the theory of these horns may be found in the references cited.

Horns are essentially impedance matching devices. Their function is to match the relatively high impedance of a driving unit to the low impedance of air. They are, thus, the "acoustical" analogues of electrical transformers.

#### Derivation of One-dimensional Horn Differential Equation

This equation originally derived by A. G. Webster<sup>28</sup> is discussed in many places,<sup>29,30</sup> consequently it will be treated very briefly here. The basic assumptions are the same as those made in the dissipationless tube case: namely, that the wall is rigid, the sound waves inside the horn are plane, and that the particle velocity is all parallel to the horn axis. On the basis of these assumptions and continuity considerations similar to those made in the derivation of the 3-dimensional wave equation, an equation analogous to equation 4-20 is obtained, namely

$$p = -\rho_0 c^2 \left[ \frac{\partial \xi}{\partial x} + \left( \frac{1}{A} \frac{dA}{dx} \right) \xi \right]. \quad (4-95)$$

The force equation is unchanged and by equation 4-2 it is

$$-\frac{\partial p}{\partial x} = \rho_0 \frac{\partial^2 \xi}{\partial t^2}. \quad (4-96)$$

Differentiating the first of these equations twice with respect to  $t$  and the second one once with respect to  $x$  and then combining them, the one-dimensional horn differential equation is obtained:

$$\frac{1}{c^2} \frac{\partial^2 p}{\partial t^2} - \frac{\partial^2 \xi}{\partial x^2} - \left( \frac{1}{A} \frac{dA}{dx} \right) \frac{\partial \xi}{\partial x} = 0. \quad (4-97)$$

7236



Now assuming a sinusoidal pressure function

$$p(x, t) = p(x) e^{j\omega t}, \quad (4-98)$$

the differential equation becomes

$$\frac{d^2 p}{dx^2} + \left\{ \frac{1}{A} \frac{dA}{dx} \right\} \frac{dp}{dx} + k^2 p = 0. \quad (4-99)$$

Now choosing  $A(x)$  to correspond to the exponential horn, the differential equation becomes

$$\frac{d^2 p}{dx^2} + 2a \frac{dp}{dx} + k^2 p = 0. \quad (4-100)$$

Also from the equation of motion and the sinusoidal pressure, the velocity becomes

$$\dot{\xi}(x) = \frac{-1}{jk\rho_0 c} \cdot \frac{dp}{dx}. \quad (4-101)$$

#### Horn Functions

When the differential equation is solved, the pressure and velocity functions become

$$p(x) = e^{-ax} [A \cos bx + B \sin bx], \quad (4-102)$$

$$\dot{\xi}(x) = \frac{e^{-ax}}{jk\rho_0 c} [(aB + bA) \sin bx + (aA - bB) \cos bx], \quad (4-103)$$

where  $A$  and  $B$  are arbitrary constants and  $b$  is defined by

$$b = \sqrt{k^2 - a^2}. \quad (4-104)$$

--The input-output relations are

$$\frac{p_l}{p_a} = e^{-al} \left[ \frac{b z_l}{(jk - az_l) \sin bl + bz_l \cos bl} \right], \quad (4-105)$$

$$\frac{\dot{\xi}_l}{\dot{\xi}_a} = e^{-al} \left[ \frac{b}{(a + jkz_l) \sin bl + b \cos bl} \right], \quad (4-106)$$

$$z_a = \frac{(jk - az_l) \sin bl + bz_l \cos bl}{(a + jkz_l) \sin bl + b \cos bl}, \quad (4-107)$$

1237

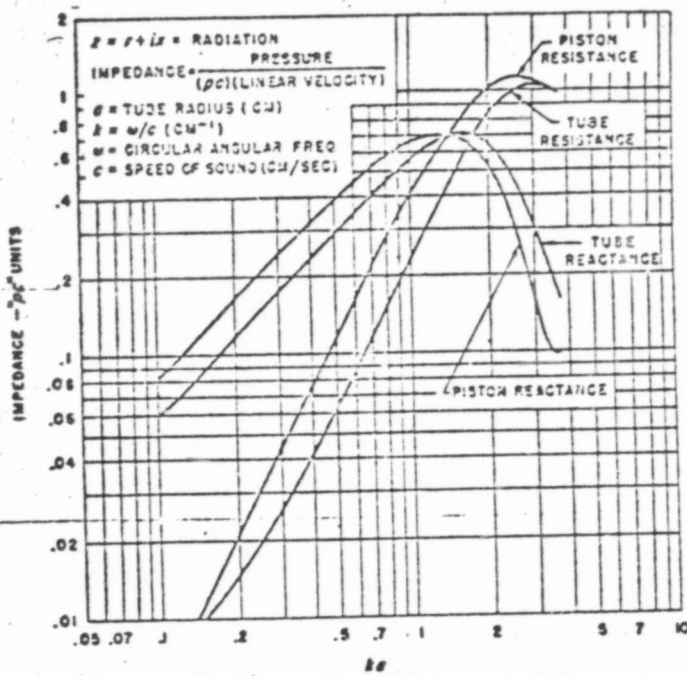
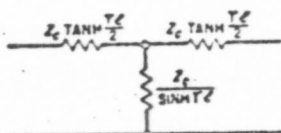
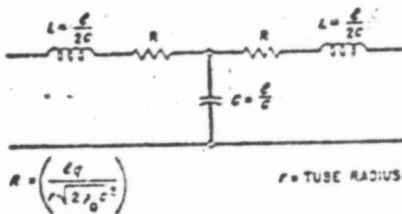


Figure 4-7 Radiation Impedance of an Unflanged Tube [Computed From Data of H. Levine and J. Schwinger, Physical Review, 73 (1948), 383] and Radiation Impedance of a Rigid Piston in an Infinite Baffle



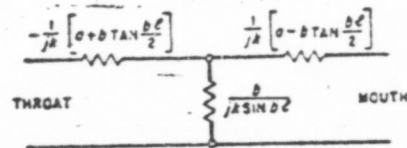
$p$  &  $Z_c$  ARE DEFINED BY EQUATION 4-92

(A) EXACTLY EQUIVALENT "T" NETWORK FOR TUBE INCLUDING DISSIPATION

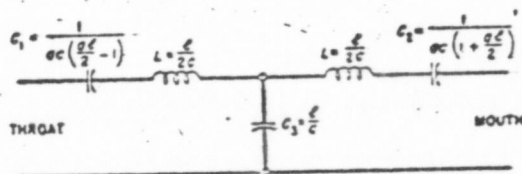


(B) APPROXIMATE EQUIVALENT "T" NETWORK FOR TUBE INCLUDING DISSIPATION

Figure 4-8 Equivalent "T" Networks for Tubes



(A) EXACTLY EQUIVALENT "T" NETWORK FOR AN EXPONENTIAL HORN



(B) APPROXIMATE EQUIVALENT "T" NETWORK FOR AN EXPONENTIAL HORN

Figure 4-9 Equivalent "T" Network for Exponential Horn

1238

where

 $l$  = horn length, $p_l, \dot{\xi}_l, z_l$  = pressure, velocity, and impedance at mouth of horn, $p_0, \dot{\xi}_0, z_0$  = pressure, velocity, and impedance at horn throat.

If a horn is part of an acoustical structure, for example as a connector between two tubes of unequal diameter or part of an acoustical filter, etc., its performance may be calculated by use of the above formulas in precisely the same manner as was done for a straight dissipationless tube. If the horn is radiating into free space, the terminal impedance  $z_l$  may be approximated by the formula for a piston in infinite baffle (equation 4-84), provided there is a large flange around the mouth. If there is no flange around the mouth then curves calculated from the work of Levine and Schwinger<sup>31</sup> may be used. Curves showing the impedances for both the flanged and unflanged cases are given in Figure 4-7.

The exponential horn is a high pass structure and this is most easily seen by considering the equations for an infinite horn. For this case the pressure, velocity, and impedance functions become

$$p(x) = A e^{-(a + jb)x},$$

$$\dot{\xi}(x) = A \left\{ \frac{a + jb}{jk\rho_0 c} \right\} e^{-(a + jb)x}, \quad (4-106)$$

$$z(x) = \frac{1}{k} (\nu + ja) = \sqrt{1 - \left[ \frac{f_c}{f} \right]^2} + j \left( \frac{f_c}{f} \right),$$

where  $A$  = an arbitrary constant,

$f$  = frequency cps,

$f_c$  = "cutoff" frequency =  $\frac{ac}{2\pi}$ .

From the definition, it is readily seen that  $b$  is a real quantity so long as  $f > f_c$ , i.e., so long as the frequency  $f$  is greater than  $f_c$ , the cutoff frequency. In this case the exponential term in the pressure or velocity function with the time factor restored becomes

$$e^{-ax} \cdot e^{-j(bx - \omega t)} = e^{-ax} \cdot e^{-jb(x - \frac{\omega}{b}t)},$$

which represents a wave traveling in the positive  $x$  direction with an amplitude decreasing according to the factor  $e^{-ax}$ . However, when the frequency falls below  $f_c$ , then  $b$  becomes imaginary and wave motion no longer exists. Thus an infinite exponential horn does not transmit sound below its cutoff frequency and hence may be regarded as a high pass structure. Finite exponential horns do transmit sound energy below cutoff, but their output is substantially reduced in this frequency region.

1239



#### 4.8 EQUIVALENT ELECTRICAL CIRCUITS

It is possible to construct electrical circuits which have the same impedance at their input terminals as do horns and tubes. The equivalent circuit for tubes is discussed in detail by W. P. Mason.<sup>32</sup> A tube or horn may be represented by a "T" network, a "π" network, or a lattice. Only the "T" network will be given here. The others may be obtained from it by well known transformations.<sup>33</sup> The exactly equivalent "T" network for a tube including dissipation is shown in Figure 4-8. When the tube is short compared to the wave length of sound (less than one eighth of a wave length), the approximate "T" network shown in Figure 4-8 can be used to represent the tube. The "T" for the dissipationless tube is obtained by merely putting the resistance equal to zero. The exact and approximate equivalent circuits for an exponential horn are shown in Figure 4-9.

#### REFERENCES

1. A. G. Webster, Partial Differential Equations of Mathematical Physics (G. E. Stechert and Company, 1933), 27.
2. P. M. Morse, Vibration and Sound (McGraw-Hill Company, 1948, Second Edition), 217-222 and 294-295.
3. H. F. Olson and F. Massa, Applied Acoustics (P. Blakiston's Sons and Company, 1939, Second Edition), 2-5.
4. H. F. Olson, Elements of Acoustical Engineering (D. Van Nostrand, 1947, Second Edition), 4-7.
5. I. B. Crandall, Theory of Vibrating Systems and Sound (D. Van Nostrand, 1926), 85-88 and 113-116.
6. H. Lamb, The Dynamical Theory of Sound (London: Edward Arnold Company, 1915, Second Edition), 160-166 and 200-208.
7. G. W. Stewart and R. B. Lindsay, Acoustics (D. Van Nostrand, 1930), 20-25.
8. W. P. Mason, Electromechanical Transducers and Wave Filters (D. Van Nostrand, 1948, Second Edition), 102.
9. N. W. McLachlan, Loud Speakers (Oxford University Press, 1934), 9-18.
10. A. Wood, Acoustics (Interscience Publishers, Inc., 1941), 55-61.
11. A. B. Wood, A Textbook of Sound (Macmillan Company, 1930), 49-58.
12. Lord Rayleigh, The Theory of Sound (Dover Publications), II, Chapters XI and XIV.
13. J. C. Slater and N. H. Frank, Introduction of Theoretical Physics (McGraw-Hill Company, 1933), Chapter VI.

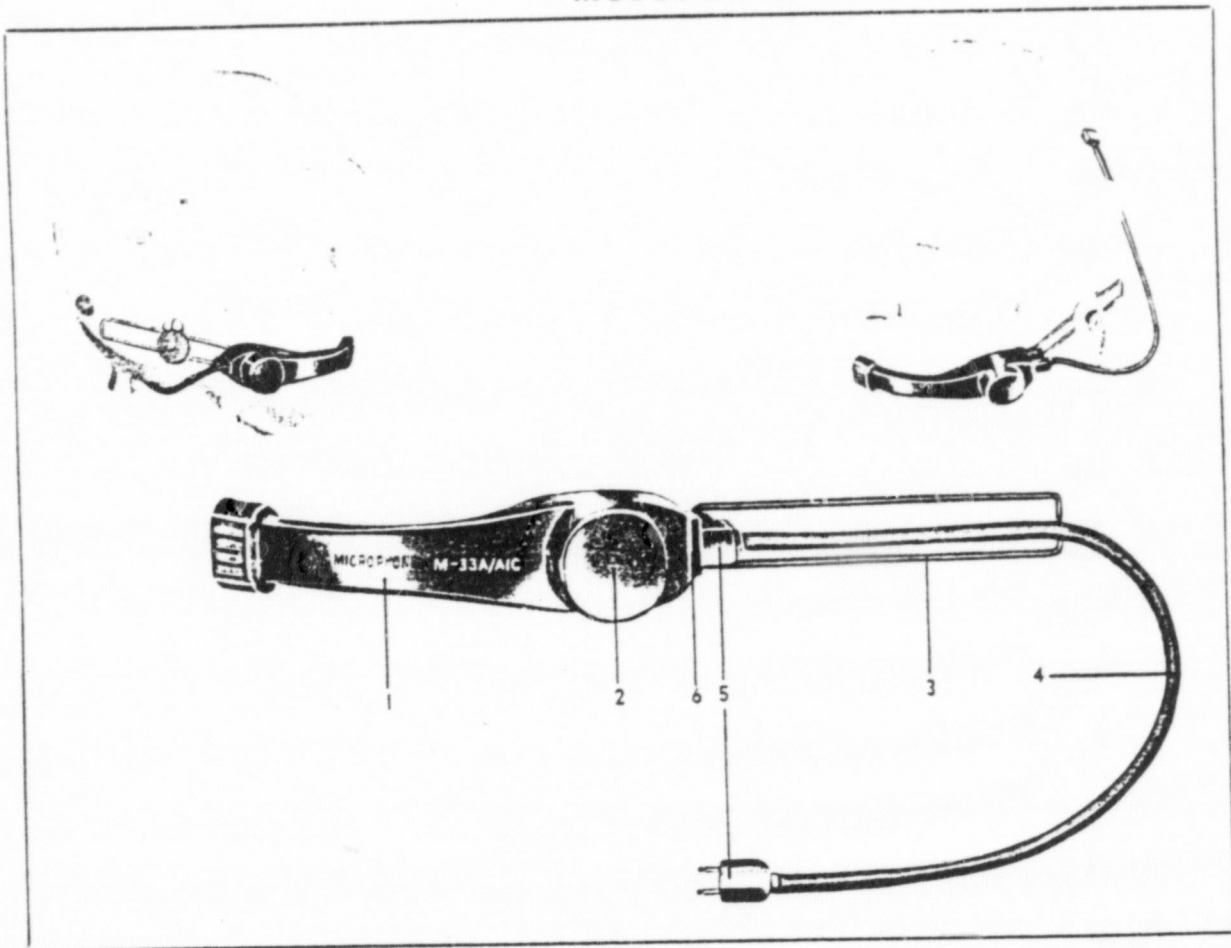
1240



Roanwell

DS-31

DYNAMIC NOISE-CANCELING  
MICROPHONE  
MODEL RM-33



DESCRIPTION

The Roanwell Model RM-33 Microphone is a close talking, noise-canceling, dynamic (moving coil) microphone. Its military version is Microphone M-33A/AIC (USAF).

As depicted above, the microphone is designed to be used on various headset and helmet assemblies in high ambient noise level areas. The voice tube (1) allows the dynamic microphone element (2) to be placed away from the user's lips without loss of the voice signal. The boom mounting arrangement (3) is ideal for use in those communication systems that necessitate the operator to have free hands.

This microphone differs from its predecessor (Microphone M-33/AIC) in that its cordset (4) is removable. The cordset is equipped with two Roanwell Model RPL-173(32) miniature plugs (5) (military type U-173/U) which are described more fully in Data Sheet DS-32. Either end of the cord may be inserted into the microphone case (6) which has a receptacle similar to the U-179/U Receptacle.

DS-31 1M 964

Ex. 22-1

124

DEFENDANT'S  
EXHIBIT

NO. 22

Roanwell CORPORATION • 180 VARICK ST., NEW YORK

*Roanwell*

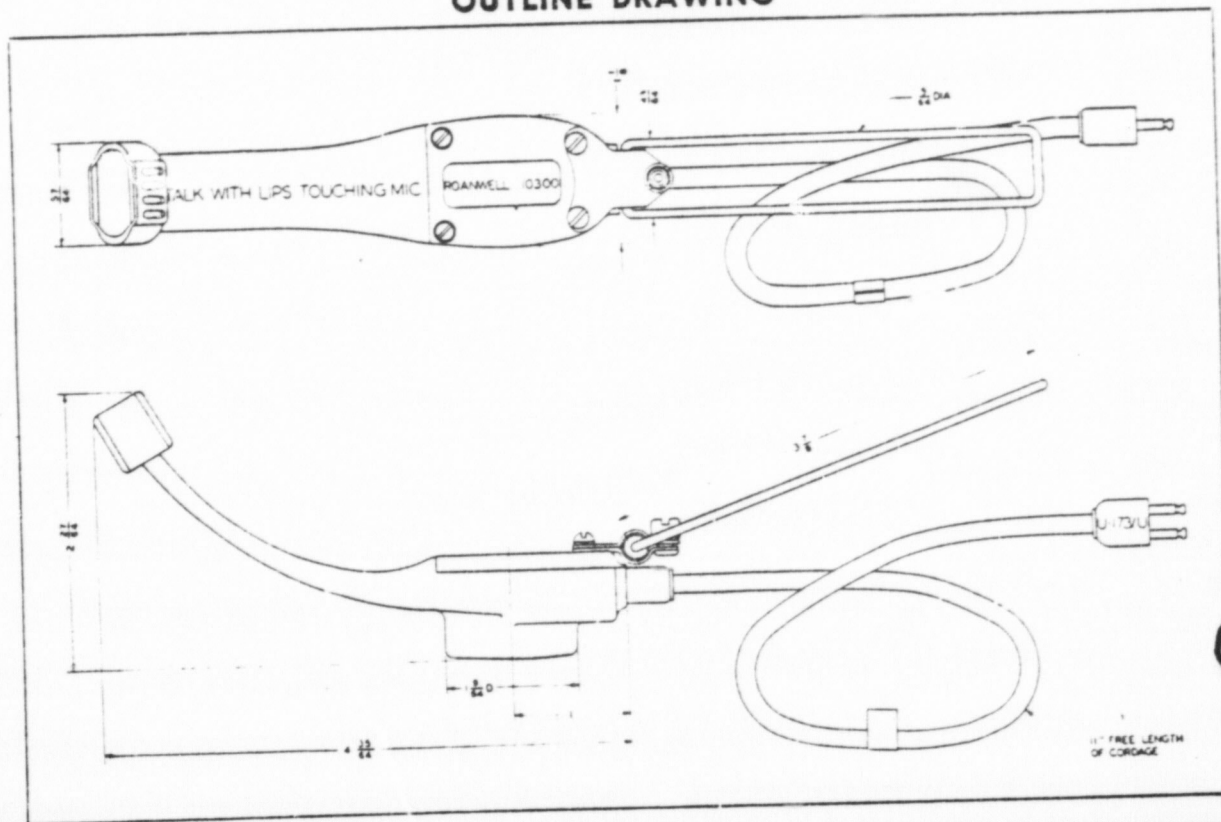
**DYNAMIC NOISE CANCELING  
MICROPHONE**

**MODEL RM-33**

**TECHNICAL DATA**

Sensitivity	-47 db re 1 mv/dyne/cm <sup>2</sup>
Frequency Range	200 cps to 5000 cps
Noise-Cancellation	Approximately 20 db over entire frequency range
Output Impedance	1.7 ohms
Harmonic Distortion	Less than 1% at normal speech levels
Directivity	Close talking; noise-canceling
Cordage	2 conductor; 13 inches long
Termination	U-173/U miniature plug (one at each end of cord)
Weight	3.0 oz.
Testing Specification	MIL-M-9239 (USAF)
Roanwell Part Number	10300

**OUTLINE DRAWING**



1242

*Roanwell*

**CORPORATION • 180 VARICK ST., NEW YORK 14, N. Y.**





Ex. 22-2

1243

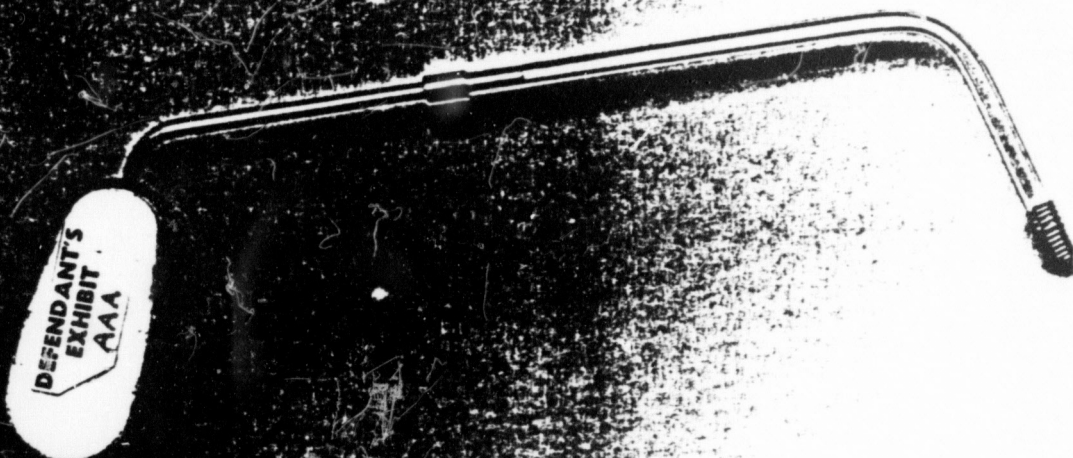
DX - 22-2

Ex. 22-2

1244

1245





Ex. AAA

1246



Ex. AAA

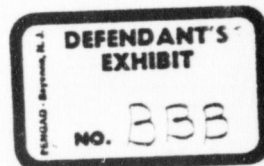
1247

# ACOUSTICAL VOICE TUBE COMPARISON

<u>Properties</u>	<u>Larkin Patent</u> <u>3,184,556 (filed 1961)</u> (DX-A)	<u>Olney et al Patent</u> <u>2,485,405 (filed 1944)</u> (DX-C, tab 2)
Inside Diameter	Not specified	Said to be 140 mils (9/64") in one model (col. 4, l. 8 & 9)*
Length	Not specified	Not specified
Material	Yieldable plastic, preferably irradiated polyolefin plastic, such as polypropylene made by Alpha Wire Company (col. 2, l. 62, col. 3, l. 39-41)	Thermo plastic material, such as Saran (col. 5, l. 7-8)
Construction	Single tube open ended	Single tube open ended (col. 10, l. 58-73)
Acoustic Damping	None disclosed	Free end treated with a suitable termination resistance, such as the silk fabric 40 shown in Fig. 6 (col. 10, l. 63-65)**
Adjustment	Yieldable material which may be formed into a pre-determined shape (col. 2, l. 63-4)	A shape-retaining deformable material, so that the tubes can be shaped to the contour of the operator's face (col. 5, l. 6-9)
Positioning	At the corner of the operator's mouth (col. 2, l. 68-70)	Not specified as to the single tube version
Resonance Characteristics	<u>Undamped</u> quarter-wave resonance, with resonant frequencies at approx. 400, 1200, 2000, 2800 and further odd multiples of 400 hertz***	<u>Damped</u> quarter-wave resonance with resonant frequencies at approx. 400, 1200, 2000, 2800 and further odd multiples of 400 hertz****

- \* Described as "tube type or probe microphone construction" (col. 1, l. 37-8), and as "fairly small, a little over 1/8" (125 mils) ID" in the Olney et al article at p. 174, left-hand col., l. 8 & 9
- \*\* Reference is made to prior art units not having proper termination resistance (col. 6, l. 34-42)
- \*\*\* See attached chart A.
- \*\*\*\* See attached chart B.

1248





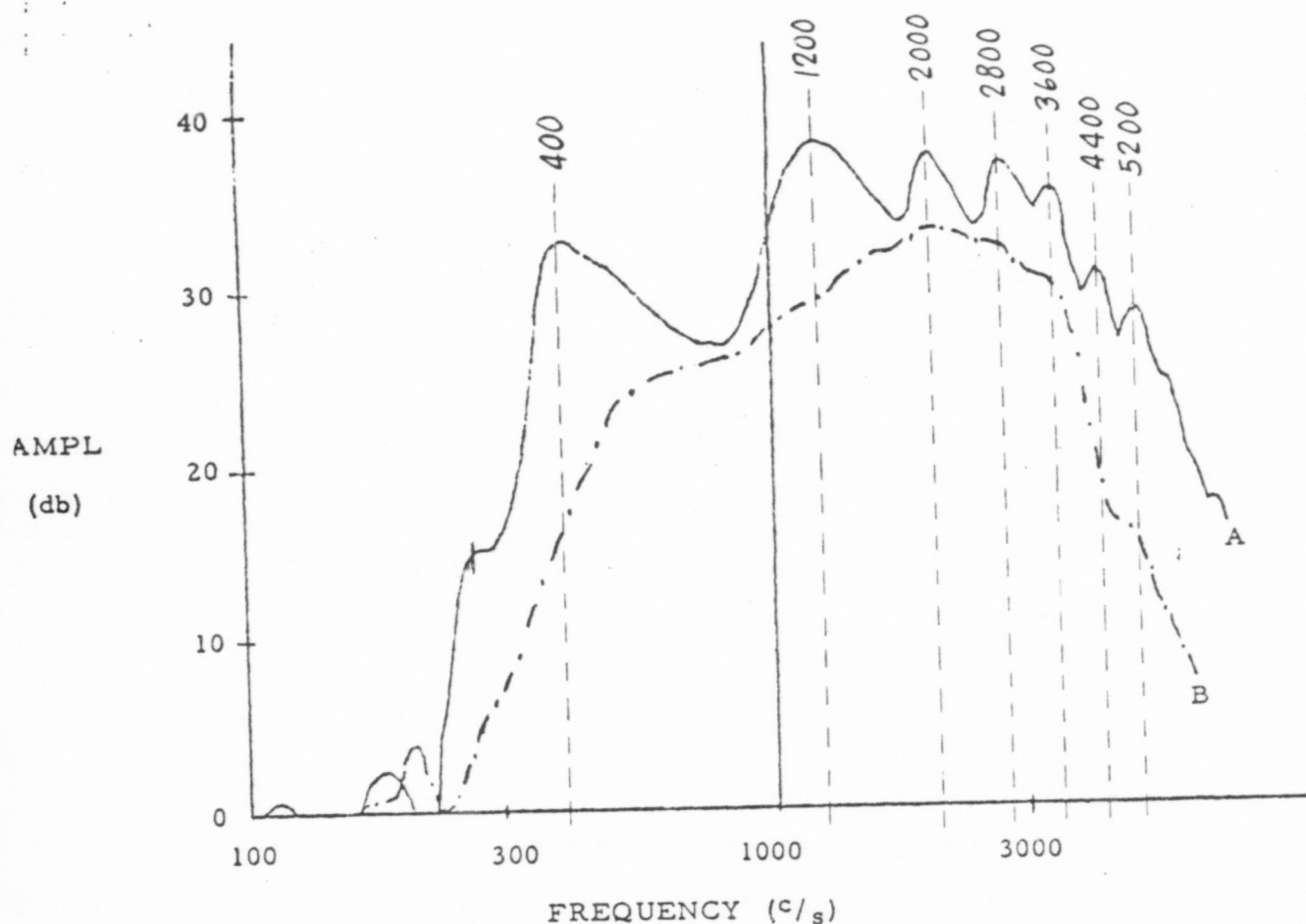


Figure 4(a). Frequency Response of MS-50 Microphone with Straight Acoustical Tube (A) and Without Tube (B)

### Chart A

[Fig. 4(a) from Larkin-Dennis paper entitled: "The Use of Acoustical Tubes To Improve Microphone Performance" presented at an SAE meeting in New York in April of 1962]

1249

Oct. 18, 1949.

B. OLNEY ET AL  
DIPOLE MICROPHONE

2,485,405

Filed April 21, 1944

6 Sheets-Sheet 4

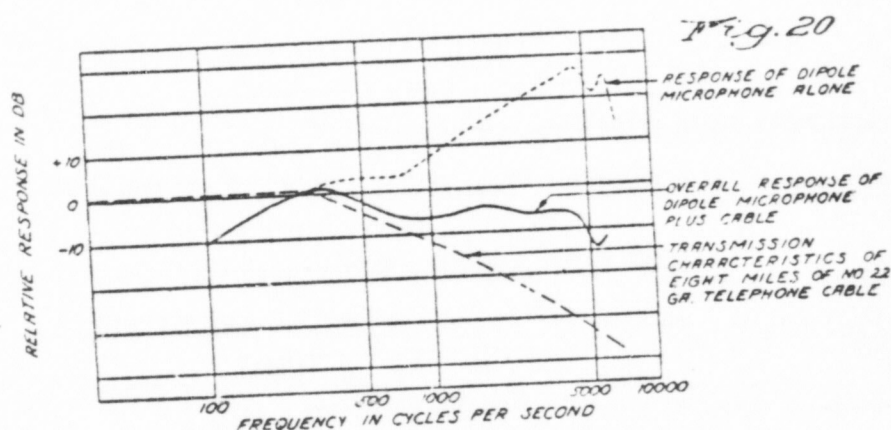
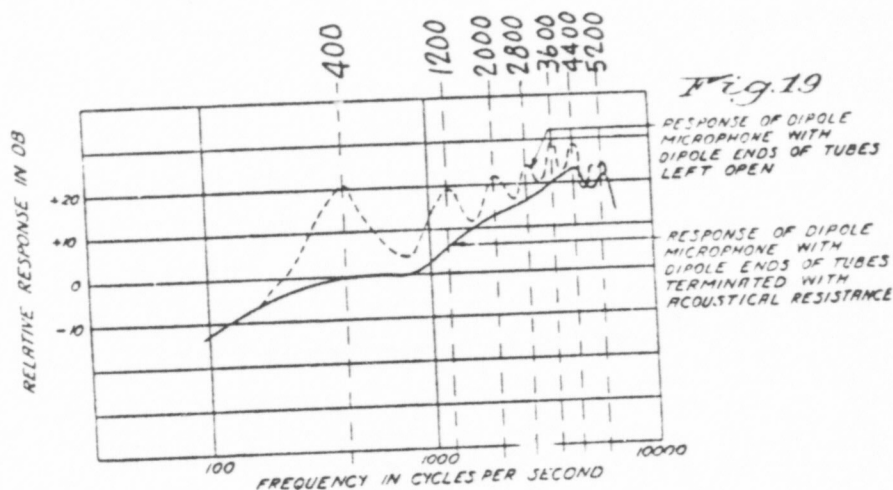
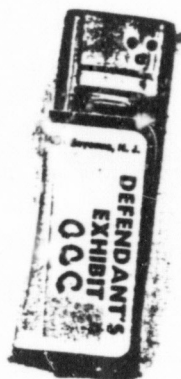


Chart B

[Figs. 19 & 20 from Olney et al patent 2,485,405]

1250



Ex. CCC

1251





Ex. CCC

1252



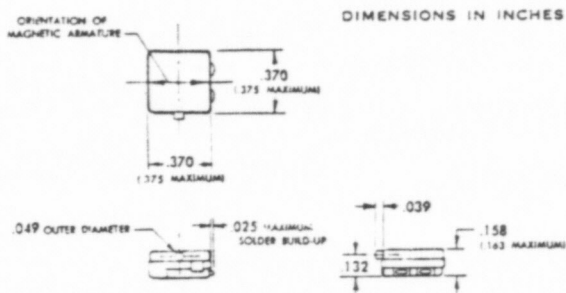
Miniature magnetic microphone for use in hearing aids, telephone headsets, portable dictating machines, pocket pagers, small transceivers, and other applications requiring both high sensitivity and small size.

Self-shielded against external magnetic fields.

Nominal impedance at 1000 Hertz:  
3500 ohms.

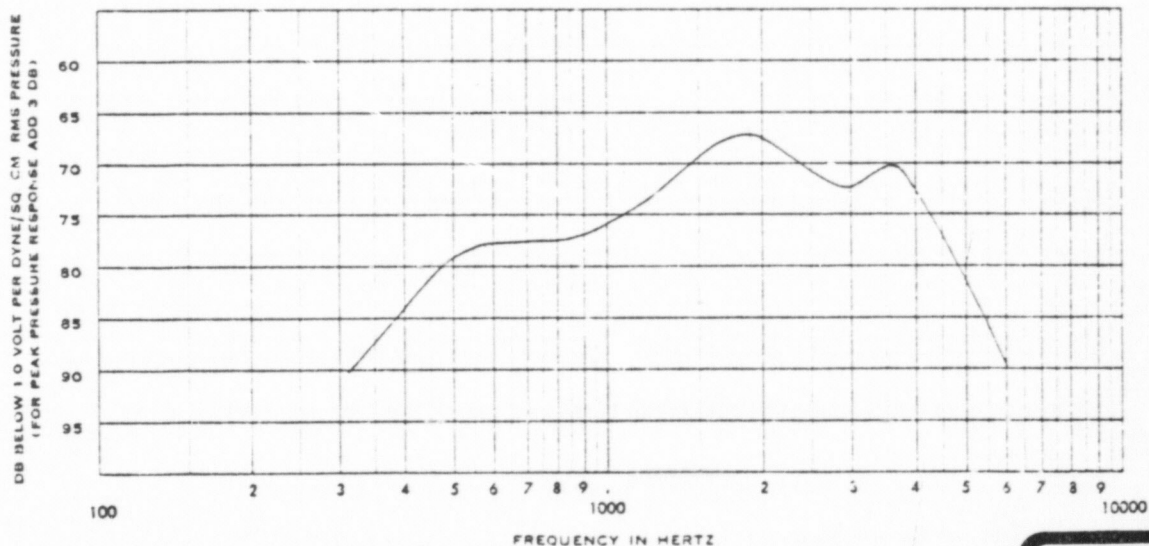
Nominal DC resistance at 20° C: 630 ohms.

MODEL BA PATENTED UNDER U. S. 3,111,563; 3,177,412; CANADA 690,572; GERMANY 1,175,745; 1,199,591; GREAT BRITAIN 959,784; 952,401; ITALY 647,507; JAPAN 454,587; SWITZERLAND 392,626. OTHER PATENTS PENDING.



ACTUAL SIZE

Typical response measured with 4000 ohm resistive load.



KNOWLES ELECTRONICS, INC.

3100 N. MANNHEIM ROAD • FRANKLIN PARK, ILL. 60131 • U.S.A.  
TELEPHONES (312) 455-3600 • CABLE - KNOLEC CHICAGO • TELEX-72-2397

PRINTED IN U.S.A.

DATA SHEET BA-1502

DEFENDANT'S EXHIBIT  
NO. DDD

1253

BA-1502